MODERN MECHANICS

FEB. 25¢

ND INVENTIONS

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GIANT SLINGSHOTS OF THE NAVY

BY REAR ADMIRAL STITT

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Where Lindbergh Learned!

BIG PAY FOR GROUND MEN AND FLYERS

Attend One of the Finest Equipped Civilian Aviation Schools in the U. S.

THINK of it! "Lindy" learned at Lincoln. You, too, learn at Lincoln! Come to the famous Lincoln Airplane and Flying School—one of the largest civilian Aviation Schools in the U. S. Get thorough, complete Aviation training. Training that gives you the right start toward a wonderful future.

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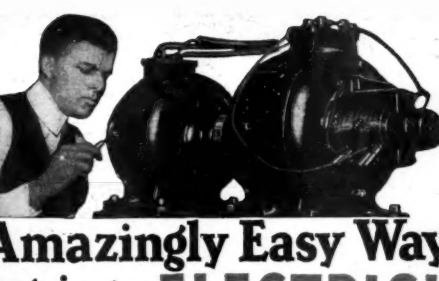


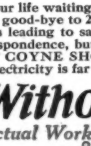
Amazingly Easy Way to get into ELECTRICITY

Don't spend your life waiting for $5 raises, in a dull, hopeless job. Now . . . and forever . . . say good-bye to 25 and 35 dollars a week. Let me show you how to qualify for jobs leading to salaries of $50, $60 and up, a week, in Electricity—NOT by correspondence, but by an amazing way to teach, RIGHT HERE IN THE GREAT COYNE SHOPS. You become a practical expert in 90 days! Getting into Electricity is far easier than you imagine!

Learn Without Lessons in 90 DAYS

By Actual Work—in the Great Shops of Coyne

Lack of experience—age, or advanced education bars no one. I don't care if you don't know an armature from an air brake—I don't expect you to! I don't care if you're 16 years old or 48—it makes no difference! Don't let lack of money stop you. Most of the men at Coyne have no more money than you have.



Railroad Fare Allowed

I will allow your railroad fare to Chicago, and if you should need part-time work I'll assist you to it. Then, in 12 brief weeks in the great roaring shops of Coyne, I train you as you never dreamed you could be trained . . . on a gigantic outlay of electrical apparatus . . . costing hundreds of thousands of dollars . . . real dynamos, engines, power plants, autos, switchboards, transmitting stations . . . everything from doorbells to farm power and lighting . . . full-sized . . . in full operation every day!

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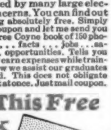
Get the Facts

Coyne is your one great chance to get into electricity. Every obstacle is removed. This school is 30 years old—Coyne training is tested—proven beyond all doubt—endorsed by many large electrical concerns. You can find out everything absolutely free. Simply mail the coupon and let me send you the big, free Coyne book of 150 photographs . . . facts . . . jobs . . . salaries . . . opportunities. Tells you how many earn expenses while training and how we assist our graduates in the field. This does not obligate you. Soact at once. Just mail coupon.

Jobs, Pay, Future

Don't worry about a job, Coyne training settles the job question for life. Demand for Coyne men often exceeds the supply. Our employment bureau gives you a lifetime service. Two weeks after graduation Clyde F. Hart got a position as electrician for the Great Western Railroad at over $100 a week. That's not unusual. We can point to Coyne men making up to $600 a month. $60 a week is only the beginning of your opportunity. You can go into radio, battery, or automotive electrical business for yourself and make up to $15,000 a year.

Get This Free Book



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MODERN MECHANICS AND INVENTIONS

VOL. III NO. 4 PRICE 25 CENTS

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FEBRUARY, 1930

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Edited *by* Experts

Listed below are the members of the Modern Mechanics Board of Editors, all qualified by national repute to serve as authorities. They will gladly answer questions from readers concerning their departments. Address them in care of this magazine, Robbinsdale, Minn.

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Last Year's Pay Looks Like Small Change to These Men Today!

Here are six men who were formerly caught in the hopeless tread-mill of low-pay jobs. Today every one of them report earnings from $4,000 up to $10,000 a year! Right now—the same opportunity that changed their lives so completely is open to you! Don't fail to read every word of this vital message!

A 300% Increase!
From $75 a month to $300 and more per month—that's the jump M. B. Scholes made thru N. S. T. A. Credits N. S. T. A. training with his success and N. S. T. A. Employment Department for his present big pay job.

Earns 2 Years Pay In 3 Months
J. M. Huppert, a $23 a week plumber's apprentice, found selling furs easier and more profitable than fixing leaks after N. S. T. A. training. In his first 3 months he had made more money than in two years at his old job.

WHEN a man who has been struggling along in a low-pay job suddenly steps out and starts earning real money—$5,000, $7,500, or $10,000 a year, he usually gives his friends quite a shock. It is hard for them to believe that he is the same man they used to know. Take one of the men whose pictures appear on this page—J. M. Huppert, for example. Huppert was a plumber's apprentice at $23 a week. If he had predicted that he was about to make two years' pay within a period of three months, his friends would have thought he was joking. But he knew what he wanted, and he set about getting it in the shortest possible way. "The Key To Master Salesmanship" opened his eyes to the opportunities in the selling profession. This book proved that Master Salesmen are made, not "born." It told facts and secrets about money-making that were a positive revelation. And best of all, it outlined a simple plan that enables men from all walks of life to quickly reach the top without spending years on the road—without losing a day or a dollar from their present positions!

Doubled His Pay
A. Rodstaille found in N. S. T. A. training "a lifetime of selling experience." My earnings have jumped to 100% more than I got at the time I began studying your course."

His Own Boss—At Doubled Wages
"I'm my own boss now" proudly writes W. Hayes, an N. S. T. A. graduate, "since taking this course I have more than doubled my income." In one week recently three other concerns tried to hire him away from his present job.

A Few Weeks—Then Bigger Pay

Huppert seized the opportunity to qualify as a Master Salesman, and has richly profited by it. He now reports an increase of many times his former weekly earnings, and his future possibilities are unlimited. Some of his former friends perhaps say he was "lucky." He was. But his "luck" lay in his decision to cast his lot with the N. S. T. A. Thousands of other men have been similarly "lucky". Some report increases ranging up to 900%. They have forgotten the days when they were caught in the rut—but they never forget that they owe a great part of their success to N. S. T. A. training.

Worth $5,000 To Him
"I wouldn't take $5,000 for what you've done for me," writes C. B. Sterling. "Your training has actually increased my income over 300%." Shortly after enrolling, he led the sales force of his company.

$5,000 A Year!
Ask J. A. Ferland if N. S. T. A. training pays. A French-Canadian farmhand man—little education in English, N. S. T. A. training won him a sales managership at $5,000 a year **to start.**

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Dept. B-702, N. S. T. A. Bldg., Chicago, Illinois.

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You may have doubts in your own mind about how salesmanship can help you to solve your own problem. If so, we cannot urge you too strongly to read the same fascinating message that inspired Huppert, Ferland and Scholes, and the thousands of others who took this remarkable short cut to success. If we were asking two or three dollars a copy for "The Key To Master Salesmanship," you might hesitate. But it is now **FREE!** See for yourself what salesmanship has done for others—and what the National Salesmen's Training Association stands ready to do for you. No matter what your present thoughts on selling are, "The Key To Master Salesmanship," will give you a new insight into this fascinating and highly-paid profession. Mail the coupon for your Free copy **NOW!**

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"SURE! I get $100 a week in ELECTRICITY—

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WOULDN'T **you** like to be able to say truthfully what Ralph Crousore of Greencastle, Indiana, says? Wouldn't **you** be proud to say to **your** friends, "Sure, I get $100 a week in Electricity"? Wouldn't you like to be sitting on top of the world with a fine Big Money Job, a brilliant future, and all the good things of life within your grasp? Of course you would! Well, then, why don't you do like Crousore and thousands of other fellows no smarter than you have done—

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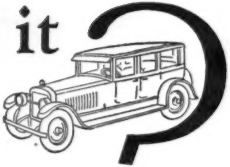

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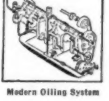

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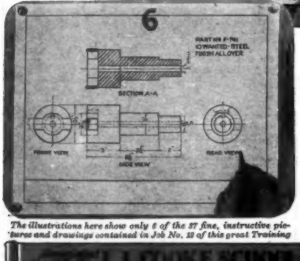

The illustrations here show only 6 of the 57 fine, instructive pictures and drawings contained in Job No. 12 of this great Training

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Everyone knows that Drafting is the Open Door to the Big Pay Jobs in the Mechanical World — the jobs that pay $60 to $100 a week and up — the jobs you **can't** get unless you're a Draftsman. Why not get into this great work now that this Training has made it so easy — why put off any longer the success other fellows like you now enjoy — why don't you, too, jump into Drafting this quicker, surer way?

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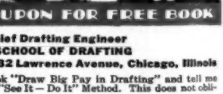

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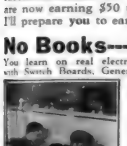

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I don't believe in books or printed lessons, or dry lectures. I believe in the practical shop way. I want every McSweeny Graduate to be an electrical expert, and that's what he becomes when he finishes my course. Here I put you into the very heart of electricity. I teach you every phase from A to Z—alternating and direct currents. My course is complete—Installation, substation work, motor and generator repairing, telephone, telegraph, and radio electricity.

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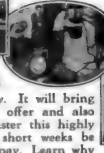
You don't have to have any special previous education or training, to grasp my simple method of instruction. You don't even need to know anything about electricity now. I don't care if you can't tell a motor from a horse-and-buggy this minute—I guarantee that when you have finished my course you will know electricity thoroughly and be qualified to fill a big pay job. And if you are not, I'll refund every penny of your tuition.



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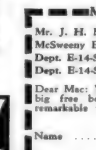

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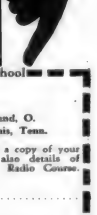

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McSweeny Electrical Shops.
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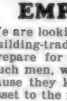

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Everyone knows how women detest the dangerous old-style can opener. Imagine, then, how they welcome this startling *new* method—this *automatic* way of doing their most distasteful kitchen task. Men, honestly I'm not exaggerating one bit when I tell you that not ten words are necessary to sell any of them! All you do is hand your demonstrator to your prospect and let her try it! She sells herself in ten seconds by the clock—and you pocket a nice, fat profit! Yes, really, it's just that simple and easy! That's why $75 to $150 in a week is easy almost anywhere.

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You just fasten the can in the holder and turn the handle. Nothing complicated, nothing to get out of order. Opens any can, square, round, or oval, in a few seconds. And, men, IT'S TRIPLE PATENTED, so there is no competition.

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"Here is my record for first 30 days with Speedo: June 13, 60 Speedos; June 20, 84 Speedos; June 30, 192 Speedos; July 6, 288 Speedos. Speedo sells to 9 out of 10 prospects." M. Orn[illegible], Va.

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Radio's amazing growth is making many big jobs. The world wide use of receiving sets and the lack of trained men to sell, install and service them has opened many splendid chances for spare time and full time businesses.

Ever so often a new business is started in this country. We have seen how the growth of the automobile industry, electricity and others made men rich. Now Radio is doing the same thing. Its growth has already made many men rich and will make more wealthy in the future. Surely you are not going to pass up this wonderful chance for success.

More Trained Radio Men Needed

A famous Radio expert says there are four good jobs for every man trained to hold them. Radio has grown so fast that it simply has not got the number of trained men it needs. Every year there are hundreds of fine jobs among its many branches such as broadcasting stations, Radio factories, jobbers, dealers, on board ship, commercial land stations, and many others. Many of the six to ten million receiving sets now in use are only 25% to 40% efficient. This has made your big chance for a spare time or full time business of your own selling, installing, repairing sets.

So Many Opportunities You Can Make Extra Money While Learning

Many of our students make $10, $20, $30 a week extra while learning. I'll show you the plans and ideas that have proved successful for them—show you how to begin making extra money shortly after you enroll. G. W. Page, 1807-21st Ave., S., Nashville, Tenn., made $935 in his spare time while taking my course.

I Give You Practical Radio Experience With My Course

My course is not just theory. My method gives you practical Radio experience—you learn the "how" and "why" of practically every type of Radio set made. This gives you confidence to tackle any Radio problems and shows up in your pay envelope too.

I Will Train You At Home In Your Spare Time

I bring my training to you. Hold your job. Give me only part of your spare time. You don't have to be a college or high school graduate. Many of my graduates now making big money in Radio didn't even finish the grades. Boys 14, 15 years old and men up to 60 have finished my course successfully.

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I will give you a written agreement the day you enroll to refund your money if you are not satisfied with the lessons and instruction service when you complete the course. You are the only judge. The resources of the N. R. I. Pioneer and Largest Home-Study Radio school in the world stand back of this agreement.

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Find out what Radio offers you. My 64-page book, "Rich Rewards in Radio" points out the money making opportunities the growth of Radio has made for you. Clip the coupon. Send it to me. You won't be obligated in the least.

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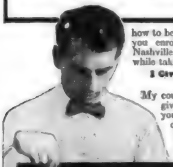

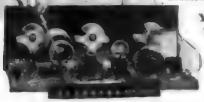

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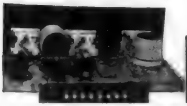

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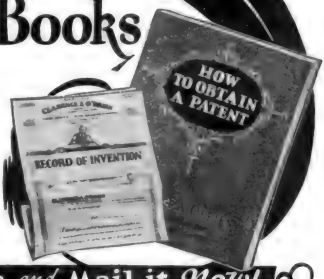

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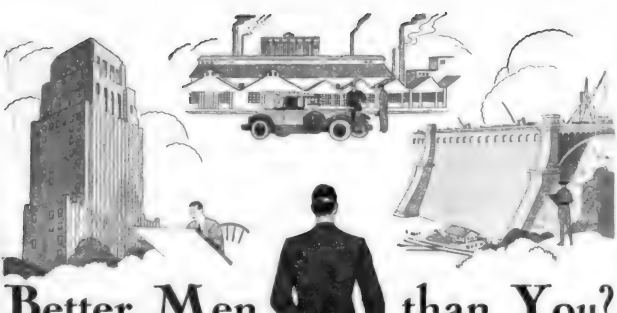

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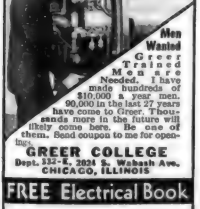

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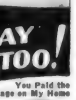

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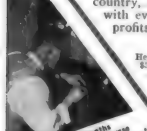

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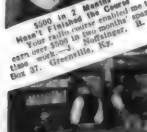

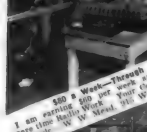

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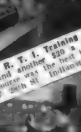
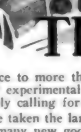
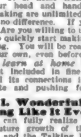
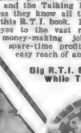
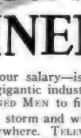
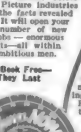


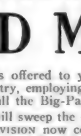


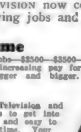


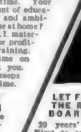












LET F. M. SCHNELL AND THE R. T. I. ADVISORY BOARD HELP YOU

30 years' Radio Experience—First to establish 2-way aeronautical communication with Europe. Former traffic Manager Am. Radio Relay League. Lieut. Com. U. S. N. R. Inventor and Designer. Cons. Radio Engineer.

Assisting him to the R. T. I. Advisory Board, composed of men prominent in the Radio Industry—manufacturing, broadcasting, engineering and servicing. All these men know Radio and will help you succeed in their field.

RADIO & TELEVISION INSTITUTE
Dept. 6S3, 4900 St. Anthony Ct., Chicago

RADIO & TELEVISION INSTITUTE
Dept. 6S3, 4900 St. Anthony Court, Chicago

Send me Free and prepaid your BIG BOOK "Turn In On Big Pay" and full details of your three-in-one Home Training (without obligating me in any way.)

Name .....

Address .....

City ..... State .....

Thank You for Mentioning Modern Mechanics and Inventions for February When Writing to Advertisers

This Free Book .. is for the Man who says:

"I'd like to get into AVIATION ·· *but I don't know how*"

"I have been taking flying instructions at the Pitcairn Airport. The study course I received from you has meant an immense saving in time and money."—S. Paul Rider, 1170 Heron Ave., Ramsey Pa.

"At your direction, I got in touch with the Sikorsky Company at College Point. I have connected with them and want to thank you for your help."—Paul J. W. Boahn, 47 Seventh Avenue, Brooklyn, N. Y.

if you are eighteen years of age or older, if you are serious enough about yourself and Aviation to train at home today for a better place tomorrow, this book will interest you.

WALTER HINTON was pilot of the famous NC-4, first plane to fly the Atlantic; he was the first Aviator to fly from North to South America; he was first to use a plane for exploration. During the war he was one of the Navy's crack flying instructors. Over 400,000 miles of flight and over thirteen years of aeronautical experience are behind his method of training.

TO some men Aviation means spirals, banks, loops, a rush of wings, a roar of motors, a challenge to red-blood.

To others it means booming factories, busy air ports, expanding commerce, mounting sales, a challenge to ambition.

It does not matter WHY you are interested in Aviation—whether you think of it in terms of action in the air or action on the ground. It offers you an immediate opportunity and a big future. And Walter Hinton can help you realize both.

What is Walter Hinton's proposition? . . . It is three-fold:

First, Hinton puts you through a thorough course of training right at home, which completely covers Aviation's "ground-work." *Everybody*, in *every* branch of Aviation, needs *training*.

Second, Hinton backs up his course of study with a personalized, man-to-man service. He gives you special coaching on the subjects that are of particular interest to you.

Third, he helps you capitalize your training. If you want to fly, he arranges for a reduction in your tuition. If you want a job, he puts you in touch with a prospective employer.

The cost of Hinton's course and service is small. The return in dollars and opportunity—is practically unlimited.

If your present occupation is not what you would like it to be—if you are EIGHTEEN years of age or older—then Hinton wants to present YOU with a copy of his book, "Wings of Opportunity."

Aviation Institute of U. S. A.

WALTER HINTON, President
1115 Connecticut Avenue, Washington, D. C.

Send to Washington

Aviation Institute of U. S. A., Walter Hinton, Pres. 322 D
1115 Connecticut Avenue, Washington, D. C.

Kindly send me a FREE copy of your book, "Wings of Opportunity." I would like to get into Aviation.

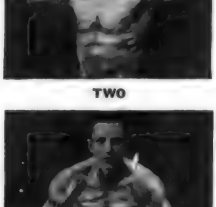
Name _____ Age _____ (Must be 18 or over)

Street _____

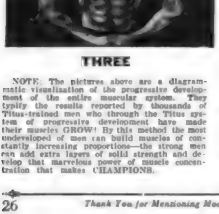
City _____ State _____

"I Never Put so FAST in

ONE



TWO



THREE

NOTE. The pictures above are a diagrammatic visualization of the progressive development of the entire muscular system. They typify the results reported by thousands of Titus-trained men who through the Titus system of progressive development have made their muscles GROW! By this method the most undeveloped of men can build muscles of constantly increasing proportions—the strong men can add extra layers of solid strength and develop that marvelous power of muscle concentration that makes CHAMPIONS.

THAT'S what one man writes: **"I never put on muscles so fast in all my life!"** And his words are echoed by thousands of others all over the world.

MIRACLES WORKED IN MUSCLES! Weak men made strong! Puny, sickly chaps transformed into husky, broad-shouldered athletes! Man, if you've got an ounce of red blood in your veins you're going to find out about this wonderful way to get STRONG. All in a few minutes a day at home. My Free Book tells the whole amazing story. Send for it TODAY.

A New Body in 20 Minutes a Day!

Find out how you can be made over! How you can quickly change into a superb model of muscular MANHOOD—how you can develop a powerful athletic build, broad shouldered, deep chested, narrow-waisted—how you can cover that frame of yours with rippling layers of solid muscle!

Man, find out what it is to LIVE! I'm going to fill you so full of glorious pep and health that you'll be the life of the party wherever you go. Read what I've done for other men and be happy—for boy, you're NEXT.

"Muscles Seem to Grow Overnight"

That's what Walter Hollyoak, of Victoria, B. C., says about the wonderful results of Titus Training. And read what Miguel Ycaza writes from the Philippine Islands: "I could hardly believe my own eyes at the great change you have made in me. My muscles grew as fast as the beanstalk in the story of 'the Giant-Killer'. I can hardly thank you for your great work; you have made a new man of me."

CAN YOU DO THESE FEATS OF STRENGTH?

How would you like to amaze your friends by tearing a telephone book or deck of cards in two? Titus Trained men do these feats and many others with ease.

Anthony Ottavio of Massillon, Ohio, is only 18—but what a MAN! He writes: **"I can bend a light horseshoe with my hands. I can lift 200 lbs with my left and right hands. I can lift 150 lbs. with one finger."** Adam Altman of Chicago, Ill., writes: **"Before I took your course I could only chin myself eight times; now I can chin myself twenty-five."**

Stanley Thompson of Multnomah, Ore., writes: **"I can tear a pack of cards in half, bend spikes, and do many other things which I could not do before. Titus-Built men sure have the speed and power behind every punch."**

WEAR THIS MEDAL

Strong men all over the world wear it as a badge of manhood. Made of solid statuary bronze and given to you free.

On Muscles *all my life"*

IT'S A GREAT LIFE IF YOU DON'T WEAKEN :=: :=: :=: **By RAFE**

Cartoonist Rafe's Humorous Conception of the Results of Titus Training

Let Me Make YOU Over

Just give me 20 minutes a day, that's all—and WATCH THOSE MUSCLES GROW! See the amazing change in 30 days. Man, won't you be PROUD of those big, rippling muscles! But don't get a swelled head when you hear the girl friends raving about your handsome, athletic build.

I don't just promise you all these good things—I GUARANTEE results. I guarantee to put a solid inch of powerful muscle on your arms, a couple more on your legs, I guarantee to develop every muscle in your body in proportion—I Guarantee to broaden your shoulders and add 5 inches to your chest—I Guarantee to strengthen your internal organs, too—I Guarantee you new pep, new energy, NEW LIFE.

WHICH IS YOU?

Look at those two pictures! Which is YOU? A puny run-down weakling, scorned by your fellowmen, avoided by the fair sex, ashamed to show yourself in a bathing suit? Hang out of it, friend! Take a look at that big boy at the right and cheer up. That's the way TITUS builds men.

Mail this Coupon TO-NIGHT!

Come on, friend, you're next! I can't begin to tell you here what Titus Training has done for thousands of men—what it will do for you—but my great new book tells the whole amazing story. This book will give you the surprise of your life—read how weaklings have been changed into strong, brawny HE-MEN—see actual photos of magnificent models of muscular manhood—discover how EASY it is for **you** to get strong. This glorious book is yours **FREE**. Mail that coupon NOW—no cost, no obligation, no salesman will bother you. There are no strings to **this** offer.

TITUS 853 **Broadway, Dept. W-147.** New York, N. Y.

FREE—MIRACLES IN MUSCLES

TITUS, Dept. W-147,
853 Broadway, New York, N. Y.

Dear Titus: Okay, send me that wonderful new book of yours "Miracles in Muscles". Get it to me by return mail without the slightest cost or obligation on my part.

Name .....

Address .....

Town ..... State.....

4 of the 40 Easy Ways to Make $3.00 an Hour In Your Spare Time in RADIO

THE four plans shown are but a sample of the many ways in which our members are making $3.00 an hour upwards, spare time and full time, *from the day they join the Association.* If you want to get into Radio, have a business of your own, make $50 to $75 weekly in your spare time, investigate the opportunities offered the inexperienced, ambitious man by the Association.

Our Members Earning Thousands of Dollars Weekly

The Association was formed to help men cash in on Radio. It makes past experience unnecessary. As a member of the Association you are trained in a quick, easy, practical way to install, service, repair, build and rebuild sets—given sure-fire money-making plans developed by us—helped to secure a position by our Employment Department. You earn while you learn, while you prepare yourself for a big-pay Radio position.

The Association will enable you to buy parts at wholesale, start in business without capital, help you get your share of the $600,000,000 spent annually for Radio. As a result of the Association, men all over the country are opening stores, increasing their pay, passing licensed operator examinations, landing big-pay positions with Radio makers.

Mail Coupon for the FREE HANDBOOK

It is not only chock-full of absorbing information about Radio, but it shows you how easily you can increase your income in your spare time. Mailing the coupon can mean $50 to $75 a week more for you.

Radio Training Association of America
4513 Ravenswood Avenue Dept. MM2 Chicago, Illinois

Below are a few reports from those cashing in on the "easy ways"

Clears $3,000.00 Frank J. Deutch, Pa.—"Since joining the Association I have cleared nearly $3,000.00. It is almost impossible for a young fellow to fail, no matter how little education he has, if he will follow your easy ways of making money."

$1,100.00 in 6 Weeks J. R. Allen, Calif.—"Have done over $1,100.00 worth of business in the last 6 weeks. Next month I am going to open up a store of my own. I never knew that money could come so fast and easy."

$25.00 a Week Spare Time N. J. Friedrich, N. Y.—"I have averaged $25.00 a week for the last 7 months even though I am not a graduate but just learning."

Training Lands Him Job R. C. Kirk, N. C.—"Your training has been very valuable to me. I landed a job with the big department store out here a few weeks ago because I had my membership card with me. There were a large bunch of applications ahead of me."

ACT NOW
If You Wish NO-COST Membership

For a limited time we will give to the ambitious man a No-Cost Membership which need not—should not—cost you a cent. For the sake of making more money now, and having a better position in the future, mail coupon below *now.*

Radio Training Association of America
Dept. MM2. 4513 Ravenswood Ave., Chicago

Gentlemen: Please send me by return mail full details of your Special No-Cost Membership Plan, and also a copy of your Radio Handbook.

Name .....

Address .....

City ..... *State* .....

Thank You for Mentioning Modern Mechanics and Inventions for February When Writing to Advertisers

STOP WORRYING about Money

Here's a New, Easy Way TO MAKE $15 a Day

Yes—here's a wonderful opportunity to start right in making up to $15 clear, cash profit in a day. You can have plenty of money to pay your bills, to spend for new clothes, furniture, a radio, pleasure trips, or whatever you want. No more pinching pennies or counting the nickels and dimes. No more saying "We can't afford it." That's the biggest mistake any man or woman ever made. *And I'll prove it.*

Over $100 Profit a Week

Just send me your name and address and I'll give you some facts that will open your eyes. I'll show you how L. C. Van Allen, of Illinois, quit a $23-a-week job, took hold of my proposition, and shortly after reported that his earnings averaged better than $100 *a week!* Then there's Gustav Karnath, of Minnesota—an ordinary farm laborer. With my plan he cleared $20.35 the first 5 hours.

Women Make Big Money, Too

Mrs. B. L. Hodges, of New York, used to worry about money. But she doesn't any more. She says, "I never fail to make a profit of $18 to $20 a day." These are just three instances. I have hundreds of letters from men and women everywhere that tell about profits of $10, $15, $20 and as high as $25 in a single day. Most of them never thought they could do it because they lacked experience. But they quickly found out how easy it is with my plan. And I'll give you the very same chance if you'll just send me your name.

No Course of Training Necessary

You don't need any capital or experience to make the big profits I offer. No course of training is necessary. You simply act as my Representative in your locality and look after my interests there. You get a profit on all business from your territory. All orders for our Groceries and other Household Necessities must go through your hands. In addition to these profits, I will supply you with Groceries, Toilet Goods and Household Supplies at our lowest rock-bottom, wholesale prices. Thus you will *save* big money as well as *make* big money.

FREE! NEW FORD TUDOR SEDAN

NOT a contest. I offer a brand-new car free to producers as an extra reward or bonus—in *addition* to their large cash profits. If you already have a car, I will give you cash instead. Mail coupon for particulars.

Start Right In

There's no waiting—no red tape—no delay. When I get the coupon from you I send full details by return mail. You can quickly be making money just like I said. You can say good-bye to money worries for good. You can live like you ought to and get some fun out of life. Men and women from all walks of life—housewives, mechanics, ministers, farmers, office and factory people—are *all* doing it. You're as good as they are. So why hold back when the coupon below gets you started?

SEND NO MONEY

If you want ready cash—a chance to make $15 or more in a day starting at once—and Groceries at Wholesale—just send me your name and address on the coupon. You can keep your present job if you want to and start with me in your spare time. Oscar Stuart, of W. Virginia, reports quick profits of $18 in 2½ hours' spare time. Miss Flora Caywood, a shoe-worker in New York, has made as high as $9 to $10 during her noon hours. Wouldn't you like to make such big money—easily, pleasantly and quickly—in your spare time? Then mail the coupon and learn how to do it.

Act at Once

Grasp this wonderful money-making opportunity right now. Make up your mind that you're going to have the things you want—that you're going to do the things you want to do. Simply mail the coupon. I will give you full details of my amazing new plan without cost or obligation to you. I'll give you the big opportunity you've long been waiting for. So don't lose a moment. Mail the coupon NOW!

THE AMERICAN PRODUCTS CO.

Albert Mills

President and General Manager

5436 Monmouth Ave., Cincinnati, Ohio.

MAIL THIS NOW

Albert Mills, Pres., American Products Co.,
5436 Monmouth Ave., Cincinnati, Ohio.

I'm ready to quit worrying about money. Send me, without cost or obligation, all the facts about your new proposition that offers a chance to make quick profits of $15 or more in a day and Groceries at wholesale besides.

Name .....

Address .....

© A. P. Co. (Print or Write Plainly)

$5 Profit on Every Sale!

No Wonder Arnold Men Make Big Money!

It's easy to get into the "big money" class when you tie up with a proposition that puts $5 in your pocket every time you take an order. You'll find it smooth sailing when you take on the

Territories Are Going Fast! Write at once!

ARNOLD CHECK-WRITER

It makes a Big Hit!

JUST WHAT EVERY LIVE AGENT IS LOOKING FOR
...an article that can be quickly demonstrated!

Nothing like it on the Market!

A real, honest-to-goodness check writer at a price no higher than a good fountain pen. Protects checks of any size. Prints and cuts exact amount in acid-proof ink. Automatic feed. Guaranteed 5 years.

Every man and woman in your vicinity who has a checking account is a prospect—individuals as well as business men—the easiest class of people to sell to because they all have bank accounts. Just what every live agent is looking for—an article that can be quickly demonstrated. Sells at a low price yet nets a big profit.

Name .....

Address .....

.....

Permanent Position!

Permanent, dignified position with immediate earnings and brilliant future. Some of our agents are making as much as bank presidents. Let us show you how you can get into this fascinating profession!

Get Into the "High-Income" Class!

Don't be satisfied with a meagre income! You can make $5 or more an hour as an Arnold man. Send coupon today for SPECIAL OFFER on Demonstrator and complete details of our attractive plan which enables you to make a day's pay in an hour a day.

Arnold Check Writer Co., Inc.
895 E. Taylor St. Flint, Mich

Thank You for Mentioning Modern Mechanics and Inventions for February When Writing to Advertisers

ENJOY THE FINEST AVIATION TRAINING

with
The School of

VON HOFFMANN

America's Leading School of

AVIATION

United States Government APPROVED SCHOOL for Transport-limited Commercial Private Pilot Ground & Flying

There is money for you in aviation if you get thorough training now! Our courses will give you this training—they are taught under the direction of U. S. licensed transport pilots and mechanics and cover everything about planes, motors, their maintenance and construction. The training which the student receives at the School of Von Hoffmann is the exact training which he must have to qualify for immediate positions on the ground or in the air. Our equipment is new and of modern design, subject to daily U. S. Government inspection—the cost is low considering actual flying and the thoroughness of ground instruction on latest modern type planes, Wright Whirlwind and other standard motors. No student bond required.

WORLD'S FAMOUS PILOTS TRAINED HERE!

Our field is identified in the world of Aviation as an outstanding place to enjoy the best training,—a place where conditions are ideal—from here was started the 'cross the Atlantic Flight that convinced the world what could be done and more recently the world endurance flight record was established here.

Von Hoffmann Aircraft School
226 Lambert, St. Louis Flying Field, St. Louis, Mo.

Easy Monthly Payments

It is easy to pay the Von Hoffmann way because small monthly payments are extended. Let us show you how you can start now and pay later, even after you have finished the course of training.

Mail this Coupon

Von Hoffmann Aircraft School,
226 Lambert-St. Louis Flying Field,
St. Louis, Mo.—MAIL TODAY.

Name .....

Address .....

City ..... State .....

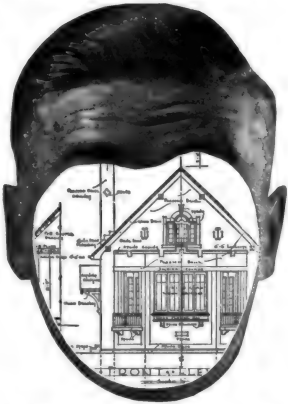
Age .....I am interested in

☐ Flying Course ☐ Ground Course
☐ Welding Course ☐ Home Study

A FRANTIC CALL FOR MEN WHO CAN READ BLUE PRINTS OF BUILDINGS

Leads Quickly to Jobs Paying up to $12,000 a Year . .

See how easy it is to get in the building game. Nowhere else does such simple training count for so much. Nowhere else can a man make up to $12,000 a year so quickly and so easily. Nowhere else are there so many countless thousands of openings as there are with contractors, builders, and real estate firms, who are constantly calling for men who can read blue prints. Six billion dollars a year is spent for building. Trained men are at a premium in this gigantic industry. Untold thousands are needed at steady salaries far above the scale wage.



90 DAYS EASY TRAINING PUTS YOU IN THE 6 BILLION DOLLAR BUILDING FIELD

NO longer is it necessary to start at the bottom of the building trades and spend years to work up. Now you can get three years' training in three months. There are no barriers to your success in the great outdoor building field. You do not need more than a common school education. We train you at home, in spare time, by the fascinating blue-print method with lessons that are as easy to read as your newspaper.

These tested plans come to you from one of the oldest and largest schools of building construction and superintendence in the country. This course is endorsed by leading contractors and master builders. These tested, practical plans and lessons are the kind of training that puts men in high salaried jobs and in profitable building and contracting businesses of their own. You learn from actual blue print plans—from practical building experts—you learn how to read all the plans, estimate the costs and supervise the entire construction of a building—you learn everything a contractor has to know when he undertakes the construction of a building.

Amazing opportunities are open to you when you know blue prints, plans, estimating and construction. There is building superintending—the best outdoor profession on earth—that pays handsome salaries and often a bonus for efficient work. Clifford Scholl went from clerk to Asst. Superintendent at 49% increase in salary in 8 months. Thousands of builders and contractors need men like Clifford Scholl.

IF YOU LIVE IN OR NEAR CHICAGO

Visit our School for Builders, open day or evening. Thousand men attend each year. Enter any time. You can get the same training at home, by mail. Same plans; same lessons; same instructors. The Coupon brings all facts FREE.

Every Job Must Have a Contractor

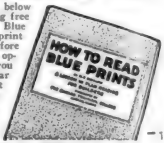
The building field is wide open for men who want to go into business for themselves. Henry Mehl, Pa., a policeman, now owns his own contracting business. Burgert, Ill., stepped into a foremanship at 200% increase in salary. Busch, Kan., writes, "I have been offered $300 a month several times." Boyes, Can., writes, "Your school has increased my wages 40% already." Patrick, Mich., says: "My salary has been increased 92%." Marchand, La., writes, "I am getting along fine. My salary is now increased 196%."

If you really want more money—if you hope to own a business of your own—get into the building business . . . no matter what your job is now. No overcrowding in this tremendous field—room for thousands every day. Why buck competition in crowded industries where only a few men can succeed?

Clerk or carpenter—office man or bricklayer—salesman or superintendent—it makes no difference. You can get into the building business quickly . . . easily. Or if you are in it at present, get this training now, that you must have for success.

FREE Book and Blue Prints

Simply mail the coupon below for an intensely interesting free book "How to Read Blue Prints," and actual blue print plans. Get these facts before you. See what amazing opportunities open up for you in the Six Billion Dollar Building Field. Don't wait or delay. Act now. Simply mail the coupon below.



Chicago Technical School for Builders,
Dept. B-163, 118 E. 26th Street, Chicago, Ill.

Send me, without obligation, your free book, "How to Read Blue Prints" and full details of the course and the opportunities in the Building Field. It is understood that no salesman will call on me.

Name .....

Address .....

City ..... State .....

Age ..... Occupation .....

Chicago Technical SCHOOL for BUILDERS

Dept. B-163, 118 E. 26th Street, Chicago, Ill.

BRAND NEW CORONA GENUINE *Model* *3

Lowest Price—Easiest Terms Ever Offered

HERE's your chance to own that *brand new* Genuine Model 3 Corona you've wanted—on the easiest terms ever offered—at LOWEST PRICE ever offered. Complete in every detail; back spacer, etc., *Manufacturer's Guarantee.* Recognized the world over as the finest, strongest, sturdiest portable built.

Yours for 10 DAYS FREE

Only a limited number of these splendid machines available. To get one, you must act now! Experience the joy this personal writing portable typewriter can give you! Use it ten days free! See how easy it is to run and the splendidly typed letters it turns out. Ideal for the office desk, home, traveling. Small, compact, light, convenient. Don't send out letters, manuscripts, reports, bills in poor handwriting when you can have this Corona at such a low price on such easy terms. Remember these are *brand new* machines right out of the Corona factory.

Carrying Case FREE
If You Act Now!

Leatheroid carrying case, offer, instructions free on this offer. Send no money—just the coupon. Without delay or red tape we will send you the Corona. Try it 10 days. If you decide to keep it, send us only $2—then $3 a month until our special price of $39.90 is paid. Now is the time to buy. This offer may never be repeated.

Save Money—Use this Coupon

Smith Typewriter Sales Corp., (Corona Division)
469 E. Ohio St., Chicago, Ill. Dept. 172

Ship me Corona, F.O.B. Chicago. On arrival I'll deposit $2 with express agent. If I keep the machine, I'll send you $3 a month until the $37.90 balance of $39.90 price is paid; the title to remain with you until then. I am to have 10 days to try the typewriter. If I decide not to keep it, I will repack and return to express agent, who will return my $2. You are to give your standard guarantee.

Name _____

Address _____

Employed by _____

$1260 TO $3400 A YEAR

MEN—WOMEN 18 UP

U. S. Government Positions are steady. Strikes, poor business conditions, lockouts or politics do not affect them. U. S. Government employees get their pay for twelve full months every year. There is no such thing as "HARD TIMES" in the U. S. Government Service.

TRAVEL—SEE YOUR COUNTRY

Railway Postal Clerks get $1,900 the first year, being paid on the first and fifteenth of each month. $79.00 each pay day. Their pay is quickly increased, the maximum being $2,700 a year. $112.50 each 15 days.

PAID VACATION

Railway Postal Clerks, like all Government employees, get a yearly vacation of 15 working days (about 18 days). On runs they usually work 3 days and have 3 days off duty, or in the same proportion. During this off duty and vacation, their pay continues just as though they were working. When away from home they get extra pay for hotel expenses. When they grow old, they are retired with a pension. Examinations soon.

CITY MAIL CARRIERS—POST OFFICE CLERKS

Clerks and Carriers commence at $1,700 a year and automatically increase $100 a year to $2,100 with special increase to $2,300. They also have 15 days' paid vacation. February examinations will be held in the larger cities. City residence is unnecessary.

GENERAL CLERKS

(Open to men and women 18 and over)

Salary $1,260 to $2,100 a year. Pleasant clerical work in the various government departments at Washington, D. C., and throughout the country.

WHAT IS YOUR FUTURE?

Compare these conditions with your present condition, perhaps changing positions frequently, kicking around from post to pillar, no chance in sight for PERMANENT employment; frequently out of a position, and the year's average salary very low. DO YOU EARN $1,900 TO $2,700 EVERY YEAR? HAVE YOU ANY ASSURANCE THAT A FEW YEARS FROM NOW YOU WILL GET $2,700 OR MORE A YEAR?

YOU CAN GET A POSITION

Country residents and city residents stand equal chance. Experience is unnecessary, and political influence is not used.

GET FREE LIST OF POSITIONS. Fill out the coupon. Tear it off and mail it today—now, at once. This investment of two cents for a postage stamp may result in your getting a Life Time Government Job.

MAIL COUPON TODAY

Rush to me free of charge (1) a full description of the position checked below; (2) Free copy of 32-page illustrated book "How to Get a United States Government Job"; (3) A list of the United States Government Jobs now obtainable.

FRANKLIN INSTITUTE Dept. D-288 ROCHESTER, N.Y.

- ☐ Railway Postal Clerk..($1,900-$2,700)
- ☐ Post Office Clerk.....($1,700-$2,300)
- ☐ City Mail Carrier.....($1,700-$2,100)
- ☐ Rural Mail Carrier.....($2,100-$3,300)
- ☐ General Clerk—File Clerk...($1,260-$2,500)
- ☐ Prohibition Agent ..Clerk...($2,300-$2,600)

Name .....

Address .....

Use This Coupon Before You Mislay It—Write or Print Plainly.

TRAIN at HOME for

Electricity

THE NEW Shop-Laboratory Way

Big Shop Laboratory Worth $60 Without Extra Cost

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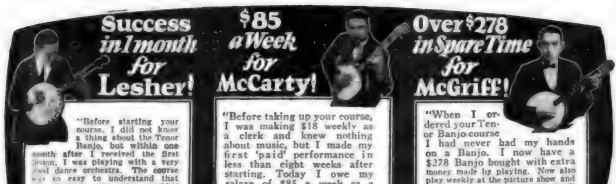

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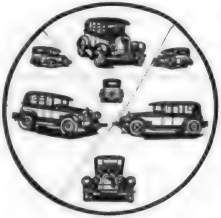

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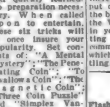

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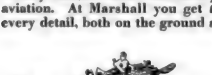

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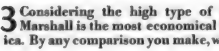

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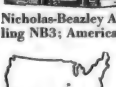

5 Marshall is an ideal little Southern city where the climate is right and living expenses cheap. Marshall citizens are 100 per cent air-minded—and their cordial hospitality to Marshall Flying School students makes your stay here both pleasant and profitable.

COMPARE THESE PRICES!

Complete Mechanical Course, 600 hours, only	$ 95.00
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Check the course in which you are interested and mail this coupon today! Let us send you additional facts about the original "College of the Air".

MARSHALL FLYING SCHOOL, Inc., 90, English Street, Marshall, Missouri

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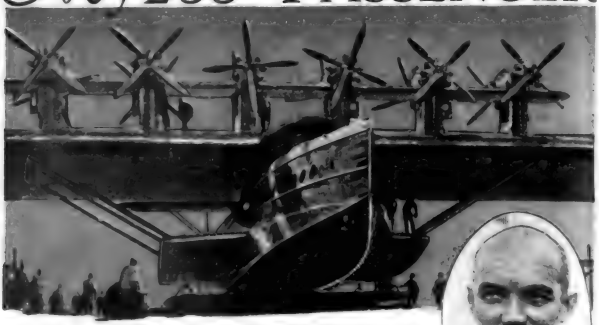
My 200-PASSENGER



Dr. Claude Dornier

Here is the story of the wonder plane of the world by the brilliant man who conceived, engineered and built it. Read Dr. Dornier's sparkling analysis of future flying problems, and of the proposed New York-South America flight to be made this spring with the DO.X!

ON a memorable bright day last fall the largest airplane in the world, the flying boat, DO.X, which I designed and built in my factory on the shores of Lake Constance, was hauled out of the workshops where it had taken shape and launched into the lake ready for its trial flight. There were many anxious spectators along the shore—many of them workmen who had helped in building the giant—but I must confess that I was as anxious as any of them, seated in the control room alongside the pilot, waiting to see if the seaplane which I had dreamed out on paper and watched take shape in wood and aluminum, would actually fly.

I knew, of course, that it would fly, despite its loaded weight of more than twenty tons, for every detail had been figured out carefully in advance. There was no reason why I should feel at all nervous, sitting there, waiting—but there is always a tenseness at such a moment, and I can only hope I did not look the way I felt. The pilot flashed back his signals to the engine room—the 12 motors roared—the graceful hull cut through the water, and in 28 seconds the great wing had borne us up into the sky! The DO.X was a success, and I felt a natural thrill of pride as its designer.

In order to form a complete picture of what the recent ten weeks tests we have conducted with the 200-passenger DO.X may mean, one must consider that repeatedly, without the slightest difficulty, we have taken off from Lake Constance (1200 feet above sea level) a load of 20,000 kilogrammes, or 44,000 pounds. This is done in less than 60 seconds.

We think that we can say with absolute certainty that reliable flight can be made with a load of at least 24,000 kilogrammes, or 52,000 pounds. This load is 20,000 pounds more than the weight of 200 passengers, who would weigh 30,000 pounds. That means there is a 20,000 pound margin for fuel. Such a load means that the wings are supporting a total weight of well over 100,000 pounds, or 45,900 kilogrammes.

PLANES

by **DR. CLAUDE DORNIER**
Builder of largest airplane in the world

The all metal flying wonder of the day—the Dornier DO.X. Note pontoons at water level and the high propellers.

It is a weight equal to the average American passenger locomotive!

You may wonder how we knew we could build a plane like the DO.X—so huge and so heavy. In order to form a picture of what lies *back* of this design one must first consider that the importance of the flying boat was first realized in England, and generally developed there. No other country can look back on so long a continuous and systematic development of building flying boats. Too, in Germany we had built many. So when we came to design a huge flying air liner, we had many good designs to depart from. To get this picture of what the DO.X is and what is behind her, I give some of the data of a large family of flying boats that were all thoroughly tried and tested. We knew we could use these loadings with success. They had made other good flying boats and we knew the information would serve us accurately.

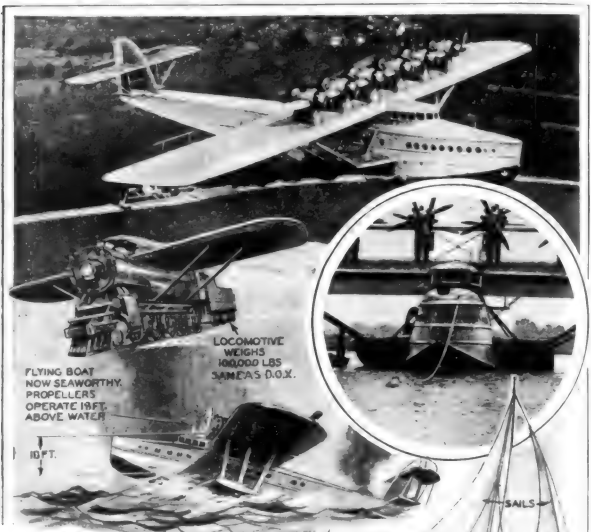
By comparing the figures for the "Libelle," "DO.E," "Wal" and "Superwal" types with the DO.X, we see that the DO.X is a type with a great future. These figures have proved their accuracy, now that flight tests are successful. You can see how much larger and heavier the DO.X is, yet how we managed to get the same loadings and weights per horsepower.

Type	Engine	H.P.	Area feet	Span feet	Length feet	Airscrew ht. above water
Libelle	Siemens	80	150	31	21	2. ft.
DO.E	Jupiter	450	520	51	36	4.5 ft.
Wal	2 Jupiters	900	930	67	54	5.3 ft.
Superwal	4 do.	2000	1480	84	72	7.5 ft.
DO.X	12 Jupiters	6000	4670	164	120	18.9 ft.

The construction of the DO.X type differs in having more than two wing spars. The possibility of finer and lighter wing construction are exploited in this type and entirely new lines are followed. One of the most notable new features is that the wing covering is no longer permanently attached to the spars and ribs, but consists of large stiff self contained plates, which are attached to the wing frames in an easily detachable manner. The engines are installed in pairs above the wings. The wings are of semi-cantilever construction. Unfortunately the construction of the wings is not the same for the flying boats under comparison in the table, but there is not much difference in weight. To illustrate the influence of size on performance consider these examples:

1. It is desired to cover a course of 600 miles with 50 per cent fuel reserve and complete equipment for mooring navigation and special purpose. What paying load

Dornier's Giant Airplane Weighs as Much as a Passenger Locomotive



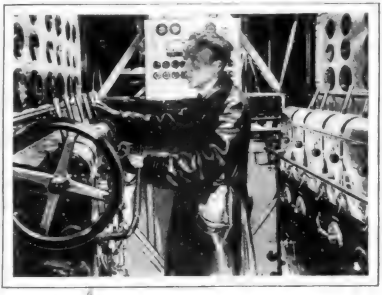
Lifting a weight over 100,000 lbs., or approximately what an ordinary passenger steam locomotive weighs, the Dornier DO.X recently completed its ten weeks' trial flights at Lake Constance, Switzerland. Above you see salient features described here by Dr. Dornier; namely, the airfoil shaped pontoons which give great stability and help flight; the high motor mounting, the whirling propellers placed 18 ft. above water level, and sail used in forced landings.

can be carried? With 50 per cent reserve the point at 1200 miles is taken and we find that Libelle, DO.E and Wal are too small for the purpose. Superwal gives a surplus load of 4500 pounds while DO.X gives a surplus of 28,800 pounds. In other words, Libelle, Wal and DO.E can carry no paying load under these conditions, while Superwal can carry 19 passengers and DO.X 120 passengers, allowing 144 pounds for the average weight of each passenger.

2. A paying load of 6600 pounds has to be carried 1500 miles with 40 per cent fuel reserve. Taking the 1800 mile point, a paying load of 6600 pounds is obtained for DO.X while the other boats fall short of this requirement.

Besides the question of carrying capacity, speed and radius of action, it is of special importance to form some view of the sea-

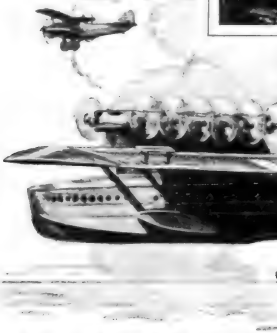
Steamship? No — DO.X Control Board!



Pilot controls direct the wing motors. The other engines are run at his signal by an engineer at a dual board as in a steamship.

worthiness of each boat. Seaworthiness is not a simple thing to define, and it is not at all clear what qualities are desirable. For the present and, it would seem, for a long time to come, most experts would think it rash to lay down precise requirements.

As a personal opinion, the seaplane must be able to fly and to meet prescribed civil or military requirements. It must be able, with full equipment, instruments and crew, to carry prescribed loads to a given place in a given time (with reasonable latitude).



This is how the Dornier DO.X, carrying 169 passengers, scales against one of the United States' large mail planes.

This implies ability to start under normal conditions. Next in importance is the ability to make a forced landing, with skilful handling, and to ride all day in a sea of from 12 feet to 18 feet. Starting under such abnormal circumstances is not necessary and not worth striving after, taking a sea exceeding 12 to 16 feet as abnormal.

The reason for this opinion is that the materials of construction available at present do not afford the means of building flying boats in a rational way, strong enough to get off in a heavy sea without risk. To meet such requirements the useful load and range would be so heavily reduced that such flying boats would answer no civil or military purpose and would therefore be practically worthless.

It is difficult to meet the one-sided demands of sea pilots for continuously increasing seaworthiness in view of the tare weight imposed by economic considerations, yet increase of size opens prospects of removing more or less completely the causes which very often lead to damage in a sea. This refers especially to the frequent damage to running airscrews by waves.

The heights of the airscrew disc above the waterline for the five types under consideration are:

Libelle	2. feet
DO.E	4.5 feet
Wal	5.3 feet
Superwal	7.5 feet
DO.X	18.9 feet

It is easy to see the advantage of the

(Continued on page 170)

Skimming the SOUTH

The most thrilling moment of Byrd's flight is pictured at left, when food supplies had to be hurriedly thrown overboard to lighten the craft to skim over a menacing mountain top.

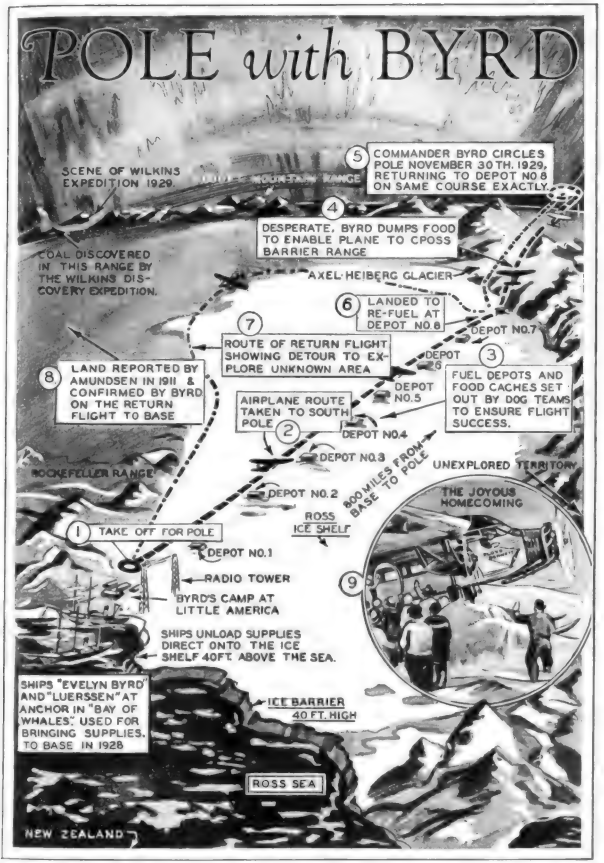
Once more the South Pole has been visited by man—but this time there was no long, arduous journey by dog team, no forced marches. In a 19-hour airplane flight, Commander Byrd has done the work of 10 years' exploration by old methods.

AIRPLANES have amply proved themselves the swiftest and most effective means of exploration known to science in the epoch-making flight of Commander Byrd to the South Pole and return last November 29th. Using a tri-motored Ford monoplane, the *Floyd Bennett*, powered with air-cooled engines, Byrd and his crew of three completed their remarkable 19-hour flight without a hitch, circling the Pole and examining from the air an immense stretch of frozen land never before seen by man, estimated at 164,000 square miles. This single flight, according to Prof. Raymond E. Priestly, geologist of the 1911 Scott Expedition, accomplished as much as 10 years' work under the old system of braving the polar lands with nothing but dog teams and will power.

Commander Byrd's long air trip furnished its share of exciting moments. The peak thrill of the flight came when the plane approached the barrier range of mountains encircling the high plateau in which is the Pole itself. The drawing at the right gives a good idea of the topography of the Antarctic, and shows the point at the flight where the mountains were reached. A glacier marked the spot of the best available pass through the rock cliffs, and along this Bernt Balchen, at the controls, piloted the plane.

At an elevation of 10,000 feet it was seen that the plane would not clear the cliffs with its heavy load. Something had to be thrown overboard, and 280 pounds of food supplies were sacrificed. Thus lightened, the ship just managed to clear a menacing knoll, aided by an up-current. A mere 200 feet meant the difference between success and failure for the expedition—but the three stout-hearted motors responded at the crucial moment.

The test of the motors was perhaps even more severe than on the men. Water-cooled engines can be shielded from cold, but the air-cooled type must be exposed to outside temperatures, and never before had motors of this type been forced to operate for so long in conditions of such extreme cold. Builders of the engines were able to shield the crankcases, oil tanks, and cylinder barrels from the extreme low temperatures, but the cooling fins of the cylinders were necessarily exposed to the super-frigid blasts.



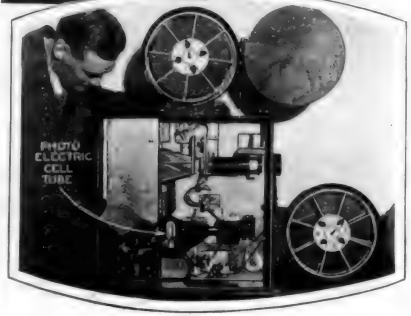
This drawing gives details of Antarctic topography, and shows the route covered by Byrd in the South Polar flight. The food depots were placed in advance by dog team, to serve in an emergency in case the plane was forced down. The distance from Little America, Byrd's headquarters, to the Pole is approximately equal to that from New York to Chicago. Four men made the polar flight.

Portable Talking Picture Exhibition Device Perfected

THESE pictures show the new portable talking picture exhibition equipment, a device observers expect to revolutionize educational methods, in that lectures of the world's greatest scientists, teachers and preachers can now be exhibited in talking movie form in any size school, church, hospital or home and can be set up in any small hall in less than 15 minutes. Several famous lecturers have been signed to have their lectures recorded for the process. Any talking picture of entertainment variety can also be projected from the portable. The outfit includes a projector to accommodate 35 m. m. film.

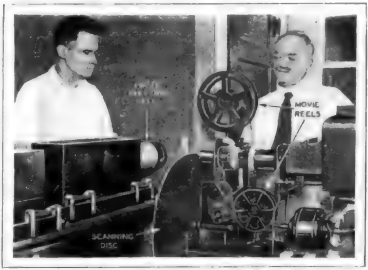
Above is shown the electro dynamic speaker and at the right the carrier for the audio amplifier and rectifier.

The sprocket holes are for the action film and the jagged line at the left for sound.



Pioneer Inventor Is Conducting a Radio Movie Station

DR. C. FRANCIS JENKINS, noted Washington scientist and pioneer in the field of radio vision, is now conducting a new high powered transmitting station near Washington, for the broadcasting of motion pictures by radio. Opening of his station was preceded by broadcasts from his laboratory for several months. The station was originally assigned to operate on a frequency of 2850 kilocycles with a power of 1.5 kilowatts. Dr. Jenkins has developed an instrument which changes the lights and shadows of the motion picture film into electrical impulses which operate the radio transmitter. The broadcasting equipment which is decidedly intricate includes a photo electric cell and a series of lenses for focussing.



Dr. Jenkins, right, is examining his television equipment.

Handy Coat Hanger for Travelers

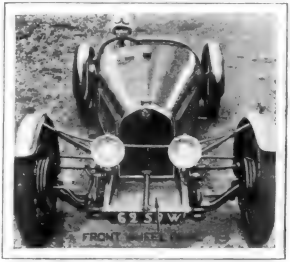
A VACUUM-CUP hanger intended primarily for use in motor cars has been placed on the market. The hanger is used for holding coats, hats and other articles. The device consists of a two-pronged metal hook fastened to a large rubber vacuum cup. It can easily be attached to any smooth surface, such as the window of an automobile or railway coach by pressing against the glass.

Spuds Now Offered in Cans

CANNING has now reached the stage where the lowly potato can be secured ready cooked and seasoned in cans. The cannery now does the washing, paring and cooking, thus simplifying the work of the housewife. The potatoes are said to retain their flavor. A special southern variety of small uniform potatoes is being canned and can be heated in the container if so desired, sliced for frying or cut into cubes for hashed brown.

Race Car Development First

ENTRANCE into the automobile field of new front wheel drive cars again proves that the racing car is the forerunner to radical changes in the commercial automobile industry. The front wheel drive automobile was first successfully used on the automobile race tracks. Connie Shooter, 21-year-old sister-in-law of Captain Miller, famous British automobile racer, drove her Lombard car, a front wheel drive machine, when she raced other lady drivers at the Brooklands event in England in 1928. The front wheel drive had been used earlier but this was simply another instance of its use on the race tracks before it was adopted in the passenger car field.



Miss Shooter in her front-drive racing car.

Amateur PICKPOCKETS

Scaltiel, master thief of the stage, is shown in training with his bell manikin. He is reaching for the stickpin in the tie and if he is the least bit clumsy the bell will ring. Thieves use such a device.

PERHAPS there is no stranger profession than that of Scaltiel, master thief and the smoothest pickpocket of them all, but who is as honest as the day is long, practicing his talents for the entertainment of theater goers and who now reveals the innermost secrets of the schools for the training of pickpockets.

Scaltiel is particularly well known throughout the European capitals and is a favorite entertainer in the Berlin Wintergarden. The story behind this "master thief" who is honest is as strange as his profession. When he was a boy his father was robbed by a pickpocket. The father advertised in a newspaper, begging the return of the money since its loss would spell ruin for his family.

Strangely, the thief read the advertisement and returned the money. The family was overjoyed and Scaltiel, then a boy, thought it would be wonderful to be able to steal and then win the grateful thanks of victims by returning the loot.

He was not afflicted with criminal tendencies or the outcome of his life would have been very different. He would have baffled the police of many cities. He started pilfering articles from his family and returning the articles to them. He was happy when he succeeded in taking some article from them without detection.

Scaltiel realized that he had succeeded in his training when one day a pickpocket stole his cigarette case and Scaltiel "stole" it back again and laughed at the thief. He became so interested in the profession that he met active pickpockets and was taken by them to their hide-out in a dirty rooming house in Berlin.

There, the pickpockets showed him a bell manikin, the chief tutor in the crime college for the light-fingered gentry. Every pocket of the dummy was wired so that the slightest touch would result in the ringing of a bell, showing that the amateur thief was clumsy. To Scaltiel's amusement, and the amazement of the professional thieves,

STUDY in CRIME College

Scaltiel, "master thief" of stage, reveals secrets of light-fingered gentry who operate throughout the world depriving victims of their valuables.

Here is exposed the pickpocket's newspaper trick, popular on subways and street cars. The thief holds a newspaper in his right hand to shield his nimble left hand in stealing a watch from a passenger.

he succeeded in taking cigarettes from the pockets of the dummy without ringing the bell.

After this test of his skill, Scaltiel decided to display his talents on the stage making an honest living as he had no desire whatever to practice the "art" dishonestly. He constructed his own bell manikin which is pictured herewith and he trains with it daily to retain his delicate touch.

The amateur who thinks that it is easy to take something from another's pockets without detection has only to try it to find out how difficult it is. There are a whole series of artful tricks used by pickpockets to prevent others than their victims from witnessing their thievery and all of these tricks have been studied by the famous entertainer.

Although the pickpocket is one of the lowliest of thieves he is also one of the most skillful. The pickpockets of the underworld most often work with accomplices to aid in jostling victims and in making away with the loot. The tricks used by the Berlin pickpockets as revealed by Scaltiel are identical with the tricks used by this type of thief throughout the world.

The professional pickpocket generally operates with his left hand while using

Another trick of thievery. The pickpocket tripped his victim "accidentally" and then robbed him while helping him to regain his feet.

his right to distract the attention of his victim. This distraction of the victim is one of the most important parts of successful pocket picking. Very often the thief holds a coat or paper in his right hand to shield the left hand which is exploring the pockets of some unsuspecting victim.

Pickpockets as a rule do not choose expensively dressed persons but rather the commonly dressed person, the visitor in the city, near railroad station, in theater crowds, on the street cars. There are numerous ways in which the thieves work according to the opportunities and situations. On a

Thief Distracts His Victim With One Hand While He Robs With Other

Here the pickpocket uses his right hand to rob his victim whose attention is distracted as shown.

crowded train a watch or wallet is taken from the pocket of a victim who is standing, the pickpocket usually holding up a paper with his right hand while his left hand does the stealing. The loot is often passed to a confederate who leaves the train.

On the streets the pickpockets often work on streetcars or subway stations and stops, wherever there is a crowd. When a man is being jostled in a crowd he is less apt to feel a hand stealing into his pocket or drawing his watch out by the chain. Sometimes a confederate or two of the pickpocket will jostle the intended victim.

A familiar trick is for the pickpocket to stumble and fall to the sidewalk directly in front of his victim. As the thief expects, the victim aids him in regaining his feet and during this contact the pickpocket clings to his victim for support and commits robbery in return for an intended kind act.

Sometimes a thief will go to great lengths to "contact" his victim. He will drop a glove under the seat of some innocent party without being seen. Then the thief will retrieve the glove and offer it to his victim who believes that some polite person has made a mistake. He will speak to the thief, unaware that while he is looking at the thief, the nimble fingers are exploring his pockets or extracting a stick pin or "lifting" a watch. The thief is holding out the glove with his right hand while his left "mit" is at work.

The public is most in danger of being robbed while in a crowd. The theater lines and groups near cloakrooms often harbor pickpockets. Although you may often suspect an innocent party if you are carrying valuables in a crowd beware of the man who holds a newspaper or magazine or has a coat slung over his arm. The pickpocket with a coat over his arm can work easily with one hand shielded by the folds of the garment.

Women who carry their valuables in handbags swung from handles are a constant source of inspiration to pickpockets for even while walking on the street or standing in a streetcar a pickpocket can open the bag, extract the valuables and close the bag without being detected and without much chance of alarming the victim.

The profession of the pickpockets is not by any means limited to men for some of the most skillful of such thieves are women and girls. Often a man will be crowded against a young woman and while he may be embarrassed the girl is not for she may be taking his watch or pocket book. Very often such girls operate with a confederate to whom she will pass her loot. The confederate will then disappear in the crowds.

Finger massage and exercise for the crook.

Scientist Has Scales for Weighing World

Dr. **Paul R. Heyl is shown above making some of his accurate calculations in his four-year job of weighing the world in his underground laboratory.**

Dr. Heyl seeks accuracy to one ten-thousandth part in checking estimated world weight of 5,997 million million million tons.

THERE may be nothing new under the sun but there is at least one scientific laboratory spectacular and amazing below the crust of the earth where Dr. Paul R. Heyl is weighing our big world. This Washington scientist has devoted the last four years to his remarkable assignment. His attempt is not the first technical drive to ascertain the accurate avoirdupois of our globe. When Doctor Heyl inaugurated his experiments, science reported the mass of the earth as 5,997 million million million tons. It was thought to be accurate to one seven hundredth part. Doctor Heyl has sought an accuracy to one ten thousandth part—and has obtained such results. This federal expert sits at a telescope in a scientific cell—a constant temperature chamber—three and one-half stories below the street line, and studies and records the activities of an imitation planetary system. From its replies to his technical inquiries new and more reliable information about the weight of the world is obtained. More than one year of painstaking work was necessary to reproduce the earth and moon and the miracles of gravitational attraction in steel and platinum miniature models. Two cylinders of solid steel which weigh 140 pounds each serve as imitation earths while the moons are represented by platinum balls weighing one and one-half ounces apiece. The two platinum balls are connected by a piece of aluminum and are so suspended by tungsten filaments in a bell jar vacuum that they constitute a perfect pendulum. The steel "earths" are mounted outside the glass container on a turntable so that they can be rotated about the platinum moons. The moons never swing more than 5 millimeters due to gravitational attraction, all such movements being reflected by means of glass mirrors into the recording telescope and its supplementary electrified "bookkeeper." Doctor Heyl seeks the most accurate gravitational constant which can be ascertained from such experiments for it is the keynote of the earth's weight. He employs only the devices described above.

Your Body Heat Is Sufficient to Cook Pan of Potatoes

SCIENTISTS have learned that our bodies are living machines of the combustion type in which the burning of fuel (food) is accompanied by the consumption of oxygen, liberation of heat energy and production of carbon dioxide as is the case in all combustion engines. Scientists find that the heat from a single person, if properly focussed, would be sufficient to cook potatoes.

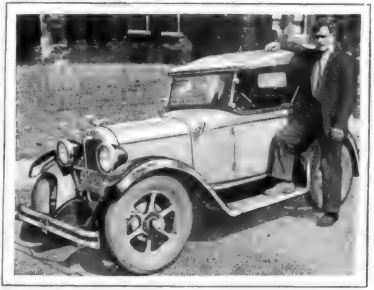
Measuring the oxygen consumption of a human being when body is in repose, for estimate of heat production.

The scales show that the body loses weight constantly, the skin always giving off watery vapor; from 25 to 40 grams every hour.

A bicycle "ergometer" is used in many experiments. The rear wheel is replaced by a heavy flywheel and friction of a band passed around the flywheel is regulated and measured. Thus work done can be calculated and expressed in foot-pounds. The oxygen used by the subject is also measured. Treadmills and moving platforms are often used for similar interesting experiments relating to walking and running.

Small and Fast Four-cylinder Automobile Is Built for $185

A MODEL four-cylinder automobile has been built at a cost of $185 by George S. Brauks, pioneer automobile mechanic of St. Louis, Missouri, who in the last 31 years has built 12 types of automobiles. The car which is of the midget type has an 86-inch wheelbase and a tread of 46 inches. It has a reputed speed of 60 miles an hour and will do 35 miles on a gallon of gasoline. Brauks maintains that his newly invented car can be profitably manufactured and distributed for $375. His is the latest entry in the midget car field in America. Recently it was announced that the Martin baby car may be sold for about $200.



George S. Brauks and his new midget auto shown above.

Reversible Spark Plug Offered

A SPARK plug with a double head, making it reversible, and giving double service from a single plug is one of the newer announcements in the automobile accessory field. The metal in the top head acts as a condenser, while the top gap acts as an intensifier, making the spark twice as hot as that in a single plug, it is claimed. Testers reported that increased mileage was obtained when this type of plug was used. The firing can be seen through a mica window in plug.

New Device to Protect Banks

PATENTS were recently granted a new bank protective device. By a mechanical arrangement which can be operated from any part of the bank, a simple trip will cause a number of bullet proof doors to fall, enclosing the cashier's cage and completely isolating it from the raiders and protecting the employes.

Owl Declares War on Man

ANYONE who has met a "man-eating" owl is invited to communicate with Professor Albert M. Reese of the University of West Virginia, at Morgantown. Such a bird came to live in Morgantown one day last summer, Professor Reese declares and for a few days actually terrorized pedestrians in one section of the city. Hiding in a tree until some passerby approached on the sidewalk, the vicious bird swooped down suddenly on the unsuspecting humans and struck them violently with its claws. The bird is described as a small one.

World's Largest Binoculars

A HUGE pair of binoculars, pictured below, believed to be the largest in the world, were placed on exhibit at the optical congress at Northampton Polytechnic, Northampton, Massachusetts.

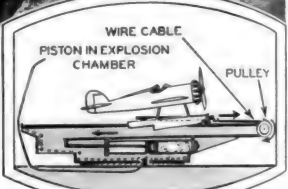
Giant SLINGSHOTS of

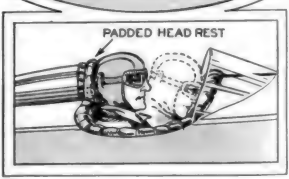
This airplane launching catapult on the S. S. Bremen is typical of those used on battleships. Note the bridge type steel girder construction.

Fighting seaplanes of Uncle Sam's navy are launched into the air by means of powerful catapults which throw them into the air like giant slingshots. This is only one of the unusual stunts which naval flyers are required to perform—which explains why only the most perfect pilots win the title of "naval aviator."

FLYING an airplane is usually regarded as being a thrilling sport in itself—but being thrown off the deck of a battleship, flung into the air like a pebble tossed by a gigantic slingshot, is not only thrilling sport, but an every day incident in the life of one of Uncle Sam's crack navy pilots. Flying from carrier decks in land planes and shooting off catapults aboard battleships test the skill of the aviators and the latter proves one of their most interesting and exciting experiences.

Planes aboard battleships are seaplanes. They take off from the catapult after having been "shot" by powder or compressed air. The powder catapult operates much like a big gun. Exploding powder expands the air in a cylinder which operates a piston that picks up and propels the carriage along the runway. In the compressed air catapult the air is built up to an enormous pressure and suddenly released.



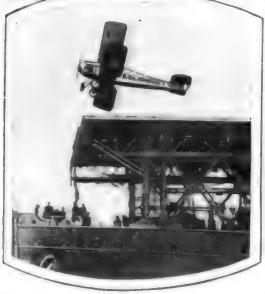


The top drawing shows the method by which a charge of powder, exploded in a cylinder, propels a piston to the end of which is attached a cable which jerks forward the carriage on which the plane rests, throwing the plane off the catapult. In the lower drawing is shown the head rest which protects the pilot from a stunning blow when the plane is moved suddenly forward by the launching device. The head must be held firmly against the cushion to absorb the jolt.

the NAVY

by **Rear Admiral E. R. Stitt (U.S.N.)**
and **Lt. Com. J. C. Adams (U.S.N.)**
Senior Flight Surgeon, Aircraft Squadrons

A speedy navy seaplane is shown above a moment after it has left the catapult of a battleship. Note the carriage on which the plane is supported, resting at the end of the track after making the "shot."



Landplanes are used at sea as well as seaplanes, but they must be housed aboard an airplane carrier, which has a special broad deck for landing.

The plane is held securely to the carriage to prevent its soaring away before reaching the end. A tripping mechanism automatically releases it at the proper moment, however, and plane and pilot climb rapidly into the air.

In a catapult takeoff the pilot must guard against the sudden jolt by holding his head firmly against a cushion. The sensation resembles that of being struck sharply by a human hand just below the base of the neck.

Lt. Rhea Taylor, commander of the squadron aboard the U. S. S. *Omaha*, flagship of the Destroyer Squadrons, Battle Fleet, in taking a younger pilot aloft from a catapult recently had an unusual experience.

"On this flight," as he relates it, "I was in the after cockpit as passenger. On my first catapult flight, I recalled, the force of the shock caused me to pull the throttle back and I almost dived into the water.

"Fearing my junior pilot might do the same thing I sat there with one hand shoving the throttle full open while with the other I hugged a radio set against my stomach.

"It is difficult for one to imagine the sensation. You sit there waiting for the powder to blow you into the air, suddenly the back of the seat presses hard forward, your head jerks backward against the rest, you dip over the side of the ship, then your engine pulls you on upward into the air. Will Rogers described his catapult experience as one of his finest in aviation."

Having taken the air, the catapulted plane must get down again at the conclusion of the flight. If the battleship happens to be at sea the landing may be complicated.

In a long, rolling, glassy swell the pilot must land with the swell regardless of the wind. He picks the top of a crest and settles down on it. If he tries to land across

Only Fittest Physical Specimens Can Pass Tests As Navy Plane Pilots

Even large twin-motored bombers can be launched with catapults. Note the torpedo under the fuselage of this bomber.

crests, he may and probably will nose his pontoon under and turn his plane over. Possibly the most difficult landings are in a choppy sea where conditions are favorable for a turn-over.

The "naval-aviator," a hard-won title, who achieves the right to represent Uncle Sam in the cockpits of his aerial eyes does so only after rigorous training. His physical qualifications are first determined, then flight surgeons examine his mental makeup to determine whether he is of the type who will continue year after year to enjoy the duties imposed on him.

Naval candidate undergoing blood pressure test. Only the fittest are accepted.

Once through the preliminary and advanced training, he sets forth monthly on exercises in which his aerial work is coordinated with that of surface ships. He becomes at once an adjunct to the battle ships and their defender against attack from the heavens.

Throughout his career flight surgeons watch him to make sure he is not "getting up his wind" or going stale. If, perchance, he suffers some accident they examine him to learn whether he suffers a permanent nervous reaction.

The aviator, once in the air, cannot be watched. He flies alone in the trim little fighters and must be thoroughly reliable. Mistakes are too costly both to the flyer and others depending on him to permit a mental failure.

You can understand why such care is taken of the pilot when you realize he may be called on to take off from a land station, rendezvous 150 miles at sea with a carrier and land on the small area of afterdeck permitted for landings.

The secret gear provided for bringing his flight to a rather abrupt halt would avail him nothing should he "land in the air," "over shoot" or crash into the stern because of too low altitude.

Navy flyers must be absolutely and not relatively precise. As a result they are the best trained aviators in the world. Theirs is a career offering at once danger and pleasure. The danger largely disappears if they are mentally awake, but let their brains slow down and it appears again. Thus they become as automatic in their decisions and

A new piece of equipment indispensable to the modern battleship is the launching catapult, almost as important to the welfare of the ship as the battery of 14-in. guns. Two are shown in place above.

movements as the machines they operate.

Aviators in order to meet the peculiar needs of navy aviation must be able to think and act almost automatically. Otherwise they cannot meet sudden emergencies.

Their flying becomes at once so rigorous and exacting that nerves, in the popular sense, cannot be tolerated. The navy aviator must be ready for a dog fight in the clouds, a cross country flight under adverse conditions or a "prevision" landing on the small area provided on the carrier flight deck.

The latter requirement is one reason we require the aviator to possess "super-normal" vision, with excellent depth perception and accommodation.

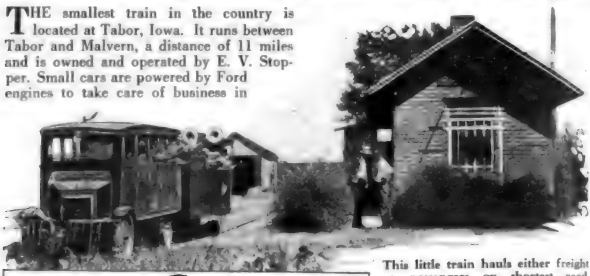
Selection of navy aviators has become in a large degree a psychological problem.

His physical abilities may be accurately measured according to standards already established. When it comes to measuring his temperamental adaptability, his power to continue to fly under the strain without going stale, the flight surgeon faces a more difficult task.

During the war the specialists in medical aviation attached the greatest importance to normal functioning of the internal ear, as determined by the Barany chair turning tests; although psychologists insisted that methods for determining the temperamental qualities of a candidate for aviation were paramount.

Smallest Train in Country Is Powered by Ford Engines

THE smallest train in the country is located at Tabor, Iowa. It runs between Tabor and Malvern, a distance of 11 miles and is owned and operated by E. V. Stopper. Small cars are powered by Ford engines to take care of business in slack season. The road is known as the Malvern and Northern line. The Interstate Commerce Commission puts a value on thi road of $135,000 because it would cost that much to build it now, but Stopper says that he wishes someone would offer him half that amount. The road runs through the "bread basket" of the world for it is in this district that the government report says is the most productive farming community on record. To do heavy hauling over his road, Stopper borrows an engine from the Burlington railroad.



This little train hauls either freight or passengers on shortest road.

Here's photo of Burlington engine borrowed for heavy duty.

Twin Discovered for Carbon

CARBON is the latest chemical element to be shown to have a twin. Last winter two California physicists showed that oxygen, long supposed to be single, was not only double, but triple. Now Dr. Arthur S. King, of the Mt. Wilson Observatory, and Dr. Raymond T. Birge, of the University of California, have found a kind of carbon that is heavier than the ordinary form. Carbon is one of the most essential elements in living matter. These experimenters heated carbon in a vacuum in an electric furnace to a temperature around 5,000 degrees Fahrenheit. When the light that it emitted was analyzed with a spectroscope, the usual bright bands of the spectrum appeared.

Delivery Cars That Advertise

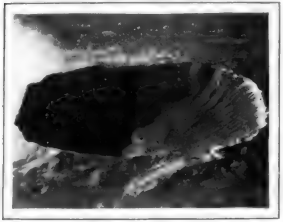
SOME unique delivery trucks and wagons are used by Los Angeles merchants, and one of the most odd is the car shown below.

New Sun Hat Doesn't Touch Head and Is Collapsible

A LIGHT sun hat that collapses and doesn't touch the head has been invented by Dr. Henry T. Pistole, of Dallas, Texas. The hat is made of wire covered with fabric. The hat support is attached to wearer's body by a belt around the waist, no part touching the head. Thus a free circulation of air is assured. The hat weighs only eight to twelve ounces according to the fabric used for covering. The device doesn't bind or irritate the skin and doesn't interfere with free use of the muscles in any sport or work. The cover is collapsed by simply pushing it back. Mosquito netting can be easily thrown over the hat and tucked into the belt.

Views of the new sun hat which is shown collapsed at right.

Arizona Crater Resembles Moon



Air view of hole made by giant meteorite.

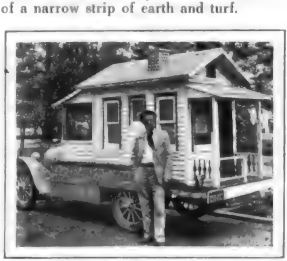
METEOR crater, near Winslow, Arizona, when viewed from the air appears very similar to a view of the moon through a giant telescope. When the meteorite came hurtling through the air it made a pit four-fifths of a mile across, and nearly 600 feet deep. There must have been a tremendous earthquake capable of shaking half a continent. There are evidences of this terrific collision all about. The slopes are littered with crushed rock. There are boulders, some weighing 7000 tons, near the edges of the crater, and farther off rocks that were thrown off at the impact are found in some instances a half mile away. It is difficult to appreciate the terrible effect of such a collision between the earth and a meteorite.

Giraffes Rest Heads on Poles

GIRAFFES are raising trouble with telephone service in Central Africa, according to George M. Bistany, big-game hunter who recently returned to this country. Bistany reports that the giraffes use the wires and poles for headrests and that as a result there are frequent wire breaks.

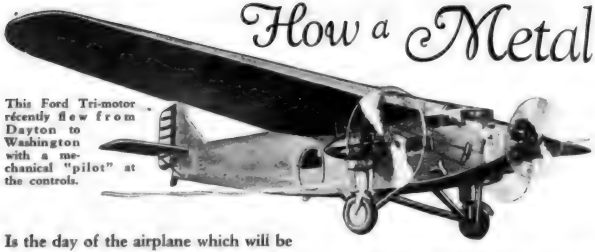
Carries Own Grass 200,000 Miles

WHEN Charles Miller, of Portland, Oregon, found the wanderlust too much for him in spite of his love for the old home, he decided to see the world and carry his home right with him, too. So he built a complete bungalow on the chassis of his car—not even forgetting to put in a nice bit of lawn. Then he started out and since starting he has traveled over 200,000 miles and isn't through yet. Mr. Miller claims to have the only motorized house and lot in the country. The "lot" consists of a narrow strip of earth and turf.



Miller shown with his motorized house and lot.

How a Metal



This Ford Tri-motor recently flew from Dayton to Washington with a mechanical "pilot" at the controls.

Is the day of the airplane which will be piloted by pushing a button almost here? A new gyroscopic control keeps an airplane on an even keel and on a predetermined course more accurately than the most experienced human pilot.

A MECHANICAL pilot, a small instrument weighing only 50 pounds and small enough to be stowed away under a chair, recently piloted a tri-motored airplane on a three-hour flight between Dayton and Washington far more accurately and with greater precision than the most accomplished human pilot.

The gyroscopic stabilizer, as the metal pilot is called, employs the familiar principle of the gyroscope in its operation, in which the motion of a free-mounted, rapid spinning disk eliminates the action of gravity. One horizontal and one vertical gyroscope are used in combination in the mechanical pilot. If the airplane equipped with this device turns of its own volition to the right, the horizontal wheel immediately tends to assume a vertical position directly equal and opposite to the degree of the turn. The force thus set up is communicated to the rudder controls by means of electromagnets, and the plane brought back to its true course. In the same manner, if the nose of the plane tends to dip or rise, or if one wing starts to dip, the vertical gyroscope actuates the controls and keeps it on even keel.

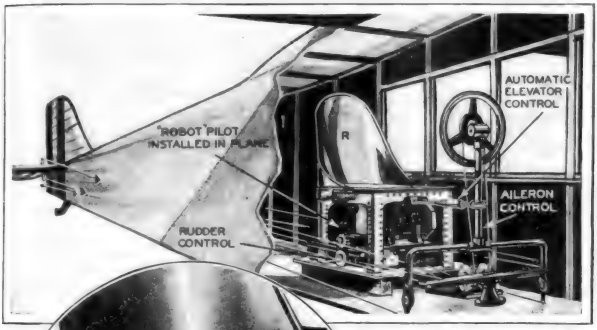
On the flight between Dayton and Washington, the plane encountered fog over the Alleghany mountains. Setting a course with plenty of altitude to clear the highest peaks, Lieut. Albert F. Hegenberger, the pilot of California-to-Hawaii fame, left the ship entirely in the "hands" of the metal pilot, and the plane emerged from the dense fog bank on an even keel.

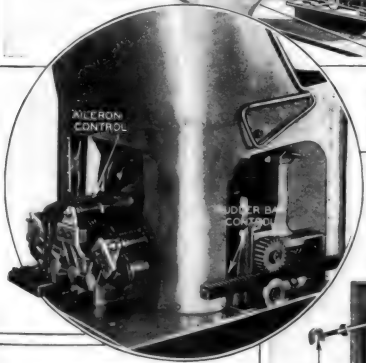
Once the plane has been set on a given course and the mechanical pilot set to guide it, nothing can turn the plane from that course provided the instrument is left alone. Wind, of course, will carry the plane in its own direction, and to counteract this the human pilot must continually check up on the ship's drift and make correction for it.

It is not only in foggy weather that the gyroscopic stabilizer is of value. Even on

These men were instrumental in developing the automatic pilot. They are Maj. A. H. Gilkerson, Elmer T. Sperry Jr., manufacturer of the device, Capt. S. A. Blair and Lt. A. F. Hegenberger.

"Man" Pilots Plane

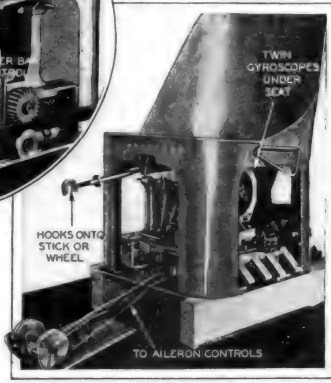




Above the artist has shown how the Robot pilot is connected to the control wheel of an airplane. At left is a closeup of the apparatus under pilot's seat, showing rudder control.

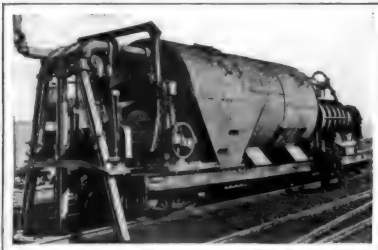
clear days cross-country flying puts more or less strain on the pilot, reducing his efficiency. Even though the pilot's attention is divided among innumerable instruments, long flights are likely to be tedious at best. The gyroscopic control maintains an automatic watch over the three axes on which an airplane moves, freeing the pilot for the more important task of navigation.

The gyroscopes of the automatic pilot revolve at a speed of 15,000 r.p.m.



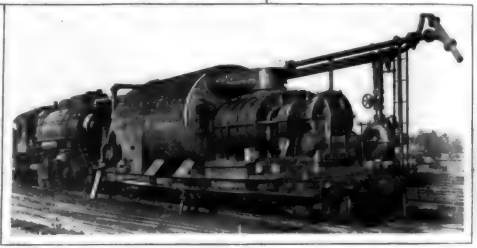
Front view of the gyroscopic stabilizer. The hook in the foreground moves the control stick forward or backward, while wires at the base control the ailerons.

World's Largest Vacuum Cleaner Keeps Rail Bed Clean



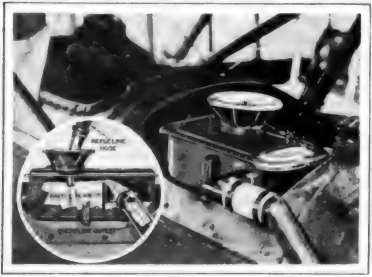
THE Pennsylvania railroad has perfected the largest vacuum cleaning machine in the world to keep clean the right of way near principal terminals. The powerful machine lifts the stone ballast and foreign matter from along the track into a great cleaning chamber and then redistributes the thoroughly cleaned ballast rock along the rails and ties. It accomplishes the work at the rate of thirty-three feet in three minutes.

The three huge suction pipes shown above pick up the loose ballast and dirt, two working outside the rails and one swinging from rail to rail inside. Power for the work is supplied by the steam locomotive that tows the cleaning equipment along the rails, leaving the road bed spic and span and sanitary.



This picture shows the complete unit. The locomotive backs up and then draws the huge vacuum cleaner to it by means of cables and a drum driven motor. The engine draws the cleaner about fifteen feet in one operation.

Refueling of Moving Airplane Simplified with Most Modern Device



Picture of the new tank with inset showing its construction.

A NEW device for the refueling of airplanes in the air has recently been perfected to simplify the operation making it faster and safer. There is a funnel shaped arrangement much like the neck of a milk can at the top of the tank where the connection is made. The refueling hose can easily be placed to fill the main tank. A baffle plate permits the overflow to enter another portion of the tank and pass out through the overflow pipe located on the outside of the ship. This simple arrangement is believed to solve many of the problems of refueling encountered in many flights.

Build Vacuum Tunnel Mile Long to Measure Light Speed

Station on mile long vacuum tube where light will be reflected back to its starting point shown here.

AN EXPERIMENT which is expected to establish the exact fractional measurement of the velocity of light and cause a complete revision of all existing calculations of the distances of heavenly bodies throughout the universe is being prepared at the Irvine Ranch near Santa Ana, California, by Dr. Albert A. Michelson and his associates of the Mt. Wilson observatory. They are building a vacuum tunnel which, when completed, will be a mile long and three feet in diameter and the work is slow due to the necessity of having it completely air tight and laid out with scientific exactness. One station is being erected at the end of the first quarter mile of the tube and from this station light will be reflected back to the starting point. Dr. Michelson was awarded the Nobel prize in physics for having originated the measure of light velocity which with his own revisions toward accuracy is the standard used by all scientists. Many phases of the study of the universe depend greatly on the accuracy of light velocity measurements.

Mobile Bank Tours Suburbs

A ROVING bank on wheels has just been put into service by the Seaboard National bank of Los Angeles, to serve a wide and diversified clientele of depositors whose demand for swift and convenient banking

facilities is thus met. Guards armed with riot guns and a sub-machinegun protect the automobile bank against hold-up men. The photo shows the traveling bank teller serving two of the moving bank's hundreds of small depositors.

World's First Motor Coach Sleeper Compared with Huge Monoplane

Double-decker sleeper bus compares favorably with big ship.

THE world's first motor coach sleeper has been completed with accommodations for twenty-six sleepers. There are upper and lower berths similar to those of an elaborately fitted Pullman car. The sleeper was taken to an airfield for comparison in size with the Ford monoplane.

The Magic of Sound

Tune the delicate goblet, sing the same low note into it, and the glass will be shattered as shown.

The laws of nature which enabled Biblical trumpets to shatter the walls of Jericho are explained in this article. On a smaller scale you can perform the same historical feat with ordinary water tumblers.

By SAM BROWN

HE WAS very grave in his demonstrations. He exhibited a delicate goblet of thinnest glass. He struck the glass sharply with his finger so that it sang out with a low, musical note. And then, lifting the glass to his mouth, he sang loudly into its depths—a low, musical note, exactly the same as that emanating from the goblet. The result was rather surprising. The glass, almost immediately, shattered into a thousand bits!

"Why?" you wonder. The reason is absurdly simple. Every note, from the low boom of the organ's basso to the shrill trill of the piccolo in martial heat, sends out vibrations. Some of these vibrations are visible—you can see them by lifting the lid of your piano; others are but faintly discernible; still others are completely lost to the sight. The glass goblet comes under the second classification; it vibrated but slightly when struck. By singing the same note into the glass, the vibrations were multiplied many times, and the frail goblet, unable to withstand a vibratory force of such strength, promptly collapsed.

A still simpler experiment, and one which anyone can perform, illustrates this same principle. Set two glasses of the same size and construction on a table. Across one of these place a piece of thin iron or steel wire, as shown in the photograph above. Pour a little water into this glass. Now, take the other glass and fill it with the same amount of water, so that when struck with the finger it will produce a

Explained by Science

Resined finger rubbed on the glass at the left will produce sound vibrations which will cause a wire on the other glass to dance.

musical note identical to that produced by the first glass.

Everything is now ready for the experiment. If you will produce a musical note by running your resined finger around the top of the second glass, you will cause the wire on the first glass to dance about in a rather quaint fashion. This results from the fact that both glasses vibrate in unison to the musical note sounded, and these vibrations are of sufficient strength to cause the wire to dance.

Two similar glasses with water at same level will sound identical notes when struck by the finger.

Now, just what is the practical value of these experiments? Here's the answer: People today are demanding less noise. Business offices desire less of the incessant chatter which goes with the average typewriter. Architects are spending both time and money in designing buildings and homes that will be sound-proof. And . . . it is only through a study of the laws governing sound, and a thorough understanding of the effects produced, that they can hope to achieve permanent results.

Scientists in New York City have constructed two remarkable rooms. In one room, if you are to run a typewriter or even talk in a conversational voice, the walls of the room will pick up the sound waves and send them back in such multiple waves as to almost deafen the average person. In the other room, a typewriter makes no more noise than the sharp click as each key

Sound Absorption of Business Offices Is Being Studied by Scientists

Performer snaps tines of fork and there is no sound. Then end of fork is touched to match box concealed in hand and sound rings clear.

strikes the platen, and the human voice is clearly audible, crisp and sharp.

What causes the difference? The basic principle is one of sound absorption. In the experiments described at the beginning of this article, glasses were used because they are *not* sound absorptive—they reflect the noise rather than absorb it. In a similar manner, the walls and ceiling of the noisy room were constructed of a highly-reflective plaster, and the furnishings were, for the most part, of hard, unupholstered wood. Knowing what causes the sounds in the first room, you can easily imagine what absorbs the sounds in the quiet room. In the first place, the plaster is of a special porous construction, very absorptive. For the second, and equally important part, the furnishings were deeply upholstered, and a profusion of drapes and heavy curtains acted as sound absorbers.

Do you see the difference? To illustrate again, have you ever noticed the "hollow" sound which emanates from rooms devoid of furniture? The sound absorbers are gone. Place furniture in the room, cover the floor with a rug, hang up the curtains, and with each successive step the "hollow" sound gets less and less until it becomes unnoticeable. The living room, especially, even with its highly-reflective brick mantel, is ordinarily a quiet room because of the profusion of sound absorbers. An exactly opposite type of room is the bathroom, almost entirely furnished with reflective materials—the haven of the world's worst singers because any voice in a bathroom reverberates back and forth until the singer's voice seems to burst out into a magnificent chorus of song.

An interesting point in connection with this matter of furniture as sound absorbers is that drapes and curtains, when hung straight, are fully one-third less absorptive than when

Match box acts as sounder preventing vibrations from being absorbed by the body.

hung in the conventional draped manner. Tests have shown that heavy felt mats are the best sound absorbers, and that rugs with a good nap are far more absorptive than hard-finish floors or floor coverings. Heavy wallpaper and plaster, too, is far ahead of brick or travetine stone as an absorber of sound.

All sound waves, of course, cannot be detected by the human ear. A novel little bit of magic illustrates this principle. The performer takes a fork in his right hand. He produces a musical note from the fork by snapping the tines with his fingers. The note lasts but a moment and then dies away. But . . . if the end of the fork is touched to a solid object, such as a small matchbox concealed in the hand, the note will at once become audible again, and the performer can pretend to be picking the note from the previously silent fork and throwing it into a glass, as shown above.

The reason for this is simple. The human body is very absorptive, so that the vibrations from the fork are almost at once "swallowed" by the hand. It still continues to sing, however, but inaudibly, until the fork's handle is touched to the hard, reflective surface of the matchbox, and then the note immediately becomes audible again.

Future years will see vast strides in the science of sound. Already, some of its principles are being put into practice in navigation and engineering. In coast navigation, especially, it is far simpler to start a sound traveling downwards, listen for the echo from the bottom, and calculate the depth of the water from the elapsed time, rather than lower a plumb line, pull it in again, measure it . . .

Man in foreground will hear sound made by the man in the distance faster by rail than by air.

The sound of this blow on a steel rail travels considerably faster by the rail than it does by air.

Of course, it must be taken into consideration that sound waves travel four times as fast in water as they do in the air. A still higher rate of speed is obtained through steel, the speed being increased fully sixteen times. You can easily observe this wide variance of speed by a simple test. Stand on a railroad track. Watch a man, some distance away, strike the steel rail with a hammer. Almost immediately you will get the sound of the blow over the rail, but a considerable interval will elapse before you hear the sound by air.

Indeed you might never hear the sound by air at all if the wind currents are of a contrary nature. Many curious incidents of this type occurred in the World war. A terrific explosion might be heard 150 miles away, yet people residing in certain areas closer to the explosion would hear nothing. The reason is obviously one of air currents, these acting at times to carry the sound high overhead, and then, perhaps, bringing it down to within hearing level some distance on.

Business men consider sound important, and, paradoxical as it may seem, their reason for its importance is that some of it must be eliminated. The typewriter is perhaps the worst offender. In a room where there is nothing but typists, the resultant chatter does not, seemingly, affect the efficiency of the workers; but typewriters in action in a room which also houses "talking" workers greatly impairs the efficiency of these talking workers.

Caterpillar Towboats for Shallow Streams

adopt the system on many shallow rivers. The electrically propelled towboats are equipped with a new caterpillar drive, operated by small Diesel electric motors, which draw only two or three feet of water, and act as switch engines in collecting barges along the stream, and permitting navigation on small shallow streams. The "train" or fleet of barges is then towed to distant points by larger towboats.

An endless chain carries the caterpillar buckets on either side of the towboat, acting both as propeller and rudder, which explains the ability of the craft to safely navigate waters as shallow as two feet.

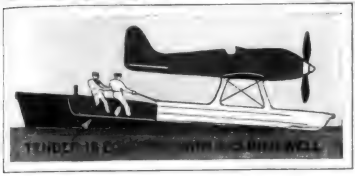
Above is shown one of the shallow draft towboats operated by a caterpillar drive on the shallow Cumberland river. And at the right is an artist's illustration of the newly invented drive in operation. This method of propelling a boat may open up 30,000 miles of shallow waterways throughout the United States thus greatly expanding this natural means of distribution.

A MARVELOUS mechanical wonder, the caterpillar towboat, recently perfected by electrical engineers, creeps up shallow streams and makes possible an economical and efficient transportation system on thousands of miles of rivers. Millions of tons of freight in the back country may now be delivered to markets at lowest ton-mile carrying cost, thanks to a towboat which is capable of hauling strings of barges at a cost as low as 18 cents per hour for fuel oil. A fleet of these boats was recently put into service on the shallow waters of the Cumberland River, in Tennessee, and proved so satisfactory that arrangements are now under way to

Photograph of the caterpillar chain drive paddles propelled by electric Diesels aboard the towboat.

Special Tenders Devised for Valuable Racing Planes

The supermarine S-6, Great Britain's entry for the famous Schneider cup airplane races is shown above being towed by its specially constructed tender, the ship being drawn by a winch up the inclined well from which the supermarine can be easily floated for the take-off. Thus the expensive and delicate pontoons are subjected to no unusual strain.



A cross section sketch showing how a hydroplane is floated up into the well of its tender.

BECAUSE of the delicate structure and high cost of pontoons for the specially built ships entered in the Schneider cup airplane races, special tenders were constructed for towing the airplanes to the starting point and for use during the test periods. The special tender is open at the stern and has an inclined well leading down into the water. A supermarine is easily floated into the well and there the pontoons grip rollers which with the aid of a winch permit secure and safe lifting of the ship up the incline. The tender can then be towed anywhere and the supermarine rolled back into the water without any dangerous or unwise stress on the pontoons or the rest of the ship structure.

New Petrified Forest in Montana

A NEW petrified forest, the only one so far discovered with the trees lying as they fell millions of years ago, is reported by the U. S. Bureau of Reclamation. It was found by a roadbuilding expedition on the Lower Yellowstone reclamation project, about three miles southwest of Savage, Montana. The petrified forest covers several acres. Some of the trees are ten feet in diameter and over 100 feet long. They all lie with their tops pointing in the same direction, indicating that they may have been blown down by a storm.

Device Teaches Telegraphy

AN ELECTRICAL device for use in either the home or the classroom in teaching telegraphy has been placed on the market. The instrument can be used for learning both receiving and sending. The speed of the sounding can be easily regulated, slow for beginners and faster for the more advanced students.

Home trainer for telegraphers is shown above.

Science Helps to Set

By
JAY EARLE MILLER

Did you know that tire tape manufacturers, shoemakers, and sewer tile contractors deserve credit for breaking many of the world's sport records? This may sound strange to you, but after you've read this fascinating article you'll agree that the statement is absolutely true.

E. L. Colyer of Cornell, pole-vaulting 12 feet to win from the British athletes of Oxford and Cambridge. Bamboo poles helped attain this record.

EDWARD B. HAMM, a tousle-headed brunette out of Georgia Tech, expanded his lungs with a good gulp of fresh air, contracted his leg muscles, sent a brain wave down to his heart ordering the pumps to open up full power and soared through the air for a new Olympic running broad jump record of twenty-five feet, four and three-quarter inches. That happened at Amsterdam on a summer's afternoon in 1928.

Now it happens that Ed Hamm is just a normal human being, with no more inches of leg muscle to contract than, say, O. J. O'Connor, the phenomenal Irishman, had back in the nineties when, from a grass take-off, he made the remarkable (for those days) jump of twenty-three feet, ten and three-quarter inches. Nor is it probable that his lung capacity is any greater than that of W. J. M. Newburn, who beat twenty-four feet in 1898, or his pumping equipment better than O'Connor's was when he came back in 1901 and fell just a quarter of an inch short of doing twenty-five feet.

A hand hold of tire tape, affording a firm grip, is part of the secret behind modern pole-vaulting records. Hickory and ash poles, formerly used, frequently broke in two.

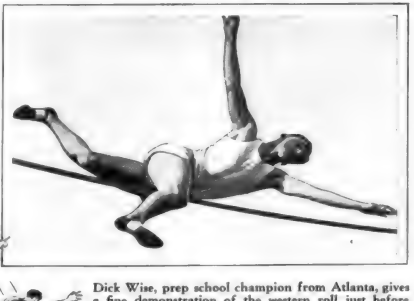
And that brings up this whole question of why sport records go on falling year after year. Unless modern athletes of each succeeding crop are more super-mannish than those of the year before, how can we explain the downfall of the records.

The answer is science, the scientific application of a lot of odds and ends of human knowledge and progress to the job of doing a thing better than the boys of father's time could do it.

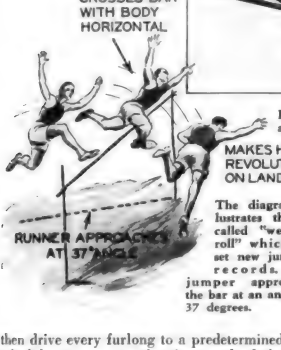
Back in the days when the late "Pop"

New SPORT Records

Geers was just a rising young fellow on the Grand Circuit harness tracks, horsemen knew the way to rate a horse along was to strap a stop watch on the wrist, plan your campaign in advance, and



Dick Wise, prep school champion from Atlanta, gives a fine demonstration of the western roll just before the left arm is dropped and the jumper turns face downward.



The diagram illustrates the so-called "western roll" which has set new jumping records. The jumper approaches the bar at an angle of 37 degrees.

then drive every furlong to a predetermined schedule as exact as the time card of the Twentieth Century Limited. Then one day, out of Finland, came Paavo Nurmi, the remarkable Finn, the greatest distance runner produced to date, with a stop watch strapped to his wrist, his race planned in advance, rating himself along at a predetermined speed that he knew would bring him in first. He checked off his laps as exactly as an engineer checks time at each wayside station, and ignored the rest of the field.

The lumber industry up in Finland broke the world's and Olympic records in a couple of track meet branches. The combination of a product of Japan and an American tire tape manufacturer broke another. Shoemakers have made possible feats your father never dreamed of, and sewer contractors and graders have set many other new marks in the world of sport.

Does that sound strange? Listen—!

Back in 1908, when the Olympic games were held in London, javelins were made from English ash and the world's record stood somewhat short of 180 feet. From the lumber industry the Finns learned that a stiff-shafted javelin made from the outer layer of wood on the sunny side of a birch tree grown in the far northern forests would travel farther than any English ash shaft ever went. The world's record today is 229 feet, three and one-eighth inches. The straight-grained, sun-cured wood from the cold north doesn't vibrate when it is thrown, so none of the energy put into it is wasted, but all goes to produce distance. That discovery won the Finnish team first, second, third and fourth places in the javelin contest at the 1920 Olympic games.

The same method of cutting wood produced the modern discus, which has replaced the old, unwieldy, heavy ringed affair of twenty years ago, and stepped the world's record up to 158 feet 1¾ inches.

Pole vaulting, in which Americans now excel, was originally a purely British sport, and a distressing one to watch, for hickory and ash poles had a habit of breaking off transversely and impaling their users in

Distance Gained in Broad Jump by Running Kick While in Mid-Air

Little tricks make all the difference between an ordinary and record-breaking jump. Note how the broad-jumper takes a step in mid-air and leans backward to cover a greater distance.

mid-air. An American conceived the idea of using light-weight bamboo, which may splinter but never breaks transversely because of its long, tough fiber, and to overcome the handicap of the slippery surface wound a hand-hold with tire tape. As a result Sabin W. Carr is the Olympic champion at 13 feet 9⅜ inches and holds a world's record of 14 feet.

Throwing the Hammer Farther

In the early days the hammer throw, as its name indicates, consisted of heaving a blacksmith's twelve-pound sledge, but the stiff shaft proved a decided handicap, and the distance gained was not especially impressive. Flexible cane handles were tried, with somewhat better results, but it remained for an American to attach a stirrup-shaped hand grip to a round iron ball with a length of piano wire and jump the record from just over seventy-eight feet to 189 feet 6½ inches.

Fellows like Charlie Paddock, the California flash, have clipped the running records time and again partly because they have developed marvelous coordination of mind and muscle, and partly because sewer and grading contractors are producing better tracks, and shoemakers more scientifically designed track shoes. An English coach turned out a one-piece shoe that gave both sprinters and jumpers a prehensile grip on the ground, and the Finns invented a wide shoe with slightly curved soles to improve their javelin and discus throwers by providing a firm foundation, and yet one that would turn easily.

The perfect coordination of mind and muscle is largely a development of training methods, so far as the rank and file of athletes go, but every now and then there comes along a man whose system conforms to no known rules, and yet he may equal or excel all the rest. Ted Meredith was a shining example of scientific training, and Paddock and Nurmi represent the unconventional. Yet, each in his own way, is as scientific as the best, and because of that each man has done his share in breaking records.

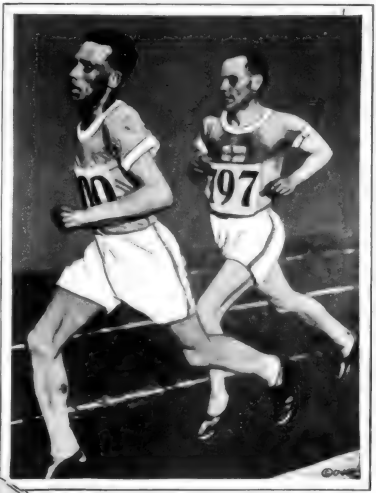
Getting back to the field events, Harold Osborne, as a 24-year-old farmer boy school teacher, cleared the bar in the high jump at six feet 8¼ inches, and that record has stood for several years. His record was made possible by the so-called "western roll" developed by George Horine, which, incidentally, isn't a roll at all, as was proved to the judges at the Olympic games in 1924, when they watched Osborne with eagle eyes, ready to disqualify him if he violated the rules by rolling or diving over

Hubbard of Michigan, famous running broad-jumper, is shown executing a running kick in mid-air to give him record-breaking impetus.

the bar. In this style of jumping the jumper takes off at an angle of thirty-seven degrees from the line of the cross bar, gives his feet twice the momentum of his head, crosses the bar with his body lying horizontally and parallel to the bar, then drops his lower, or left arm down, bends the under leg at the knee, and extends the right, or upper leg. The body gives a violent twist and describes a half revolution, turning the jumper face downward, and he has apparently, though not actually, rolled over the bar. The secret is to keep the head up all the time and you can't be disqualified for diving over head first. The knack isn't difficult to acquire.

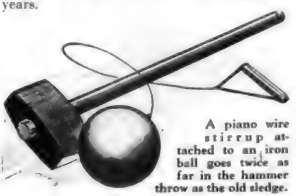
Ed Hamm's sensational broad jumping has been mentioned. Two American negroes, Hubbard and Gourdin, solved the problem of getting past the 25-foot mark, where O'Connor had failed. They introduced a running step in mid-air, and both did better than twenty-five feet. Another American, LeGendre, in the pentathlon at the Paris games in 1924, added the trick of leaning backward just prior to the mid-air step, then whipping the body violently upward during the leg movement, and he jumped 25 feet 6 inches, but, as that was not in the official broad jump competition the mark was not recognized as an Olympic record, and the world's mark has since been boosted to 25 feet 10⅝ inches.

One could go on and cite similar scientific achievements in every branch of sport.



Paavo Nurmi, the remarkable Finn, following his countryman, Willie Ritola, near the end of the 10,000-meter final at Amsterdam. Nurmi won his races by strapping a stop watch to his wrist and running according to preconceived plan. New and more efficient running shoes have also helped in setting track records.

"Babe" Ruth is a great natural batter, but the so-called "lively" ball helped him a lot, and gave the batter an advantage over the pitcher, whereas scientific study of curves had given the pitcher the edge for years.



A piano wire stirrup attached to an iron ball goes twice as far in the hammer throw as the old sledge.

Southern Pine Trees "Bleed" Three Valuable Products

Weekly a fresh streak is cut to tap the trees.

TURPENTINE, rosin and tar are products of the pine tree; and it is chiefly the long-leaf and the slash pine of the Southern United States which have been supplying these valuable materials. Millions of pines are "boxed," or tapped, for turpentine, with cups of various kinds fastened to the trunks to catch the fresh gum. Every week during the turpentine season a fresh streak is made on the tree to keep the wounds open and the gum flowing. Young trees have only one cup, but large ones may have several. Two gallons of gum from a good-sized tree is considered a good yield for a season.

Auto Barber Chair Calms Child

THE novel automobile barber chair pictured below is the latest device for keeping children quiet while having their hair trimmed or dressed. This new chair was introduced at the Hairdressing Fair of Fashion at White City in London recently. The model car is rather complete in equipment for the amusement of the child customer. The brake at the right side is used by the barber to lower or raise the chair.

This tot takes a hair-raising automobile ride.

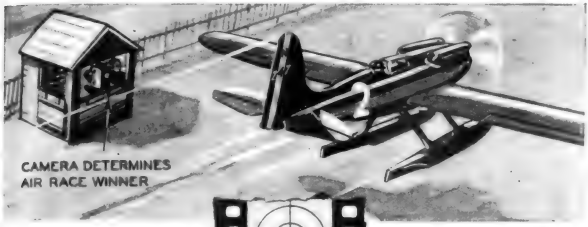
Microphone Detects Icebergs

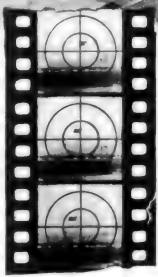
AN IMPROVISED microphone consisting of a rubber hose with a funnel attached to one end and a sheet of rubber placed over it to make it waterproof was used to record proximity of icebergs up to a distance of six miles, it is reported by Dr. Howard T. Barnes of McGill University, who has returned from a voyage of experiment off Newfoundland. The microphone records the sounds of explosions of icebergs as they break in warmer water.

New Type of Cap Can't Be Lost

AN IMPROVED type of safety cap for radiators, gasoline tanks, and chemical containers will soon be on the market. It is so constructed that it cannot be lost from the container when it is open. The cap is made of nickle-plated metal. The neck of the container has exterior threads on its upper end which engage with internal threads of the cap, which has an external circumferential groove into which a wire is snuggly fitted. The wire has end portions bent outwardly to form parallel members which are bent at right angles to form oppositely extending hinge members. An ear, which extends from the neck of the container, has a vertical slot which permits up and down movements.

Speed Camera TIMES AIR RACERS





Artist's conception of a motion picture camera recording the exact instant one of the Schneider trophy airplanes crossed the finish line. At left is shown part of film used in the races.

STOP watches being unreliable for the high speeds reached by modern aircraft the cinematographic method of recording speeds was used for the first time in the recent Schneider Trophy races. Two moving picture cameras operating at high speed were sighted along parallel lines, three kilometers apart —the length of the course. The passing of the airplanes across the field of vision of either camera was recorded on a series of consecutive photographs with connected time recorders. The time recorder on each of the cameras was connected by electricity to the other through one prong of a big tuning fork, the counters recording the vibrations of the fork which pulsated at a known and constant rate. This method permitted the accurate measurement of time to one-hundredth of one second. The cameras showed the airplanes approaching and actually crossing the start and finish line as shown on the accompanying picture of a strip of film used in timing the Schneider races.

Men Easier to Hurt Than Women

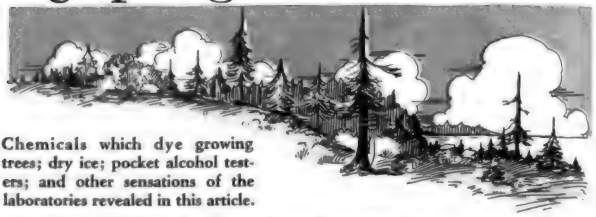
HUMAN cheeks and foreheads are the most sensitive parts of the body to pain according to investigations of Professor Uginelli, of Florence, Italy. Least sensitive are the outer sides of the arms. Contrary to the conventional idea that women are the more sensitive sex, his tests show that women feel pain about one-tenth less severely, on the average, than do men.

Machine Fixes Hosiery

A MACHINE that is expected to reduce America's hosiery bill by $100,000,000 has been perfected to mend runs in silk stockings at high speed. The needle of the electric machine is inserted in the last perfect loop of the broken thread. This loop hangs on the shank of the needle and the thread to be looped is placed on the hook. As the needle drops, the latch automatically closes, making an eye and in general follows every operation of the ordinary latch needle.

The new automatic hosiery repair machine.

Keeping PACE With



Chemicals which dye growing trees; dry ice; pocket alcohol testers; and other sensations of the laboratories revealed in this article.

By ORVILLE H. KNEEN

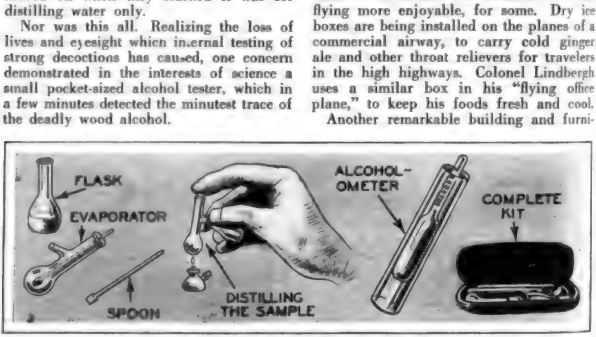
THOSE who could worm their way into this year's chemical exposition at New York concluded that we are fast becoming a nation of chemists. Also, that chemists are concentrating on food and drink, from the many exhibits in those lines, especially the latter. For while young and old seemed to wander a little aimlessly amid food-processing machines, casually inspecting strange chemical devices for baking and mixing and canning and cooking, few indeed passed by the complete distillery. They noted with interest that it was heated by electricity, gas, steam or kerosene. But they moved on when they learned it was for distilling water only.

Nor was this all. Realizing the loss of lives and eyesight which internal testing of strong decoctions has caused, one concern demonstrated in the interests of science a small pocket-sized alcohol tester, which in a few minutes detected the minutest trace of the deadly wood alcohol.

Among many exhibits of applied chemistry was the very newest cooling device. The carbo-freezer made "dry ice" while you waited. A tank of carbonic acid, such as every soda fountain uses, was connected to the freezer. At the turn of a lever the gas expanded from a terrific pressure and formed "snow-flakes" of dry ice, so fast that a block accumulated in fourteen seconds. This solidified carbon dioxide was so cold—under 40 below zero Fahrenheit—that it burned several fingers of unbelievers.

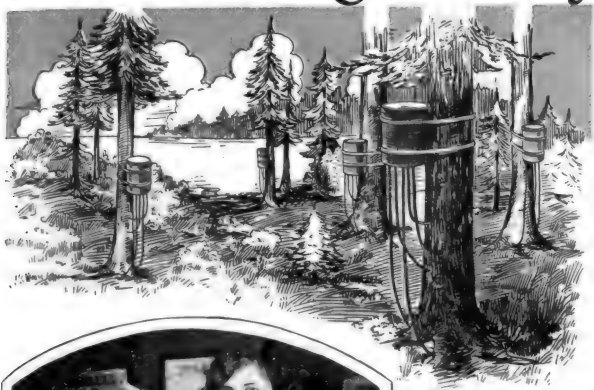
This dry ice—so named because it slowly evaporates into the air without the slightest residue of moisture—is destined to make flying more enjoyable, for some. Dry ice boxes are being installed on the planes of a commercial airway, to carry cold ginger ale and other throat relievers for travelers in the high highways. Colonel Lindbergh uses a similar box in his "flying office plane," to keep his foods fresh and cool.

Another remarkable building and furni-



Pocket kit for testing liquor for wood alcohol content was exhibited at a recent chemical exposition.

MODERN Chemistry



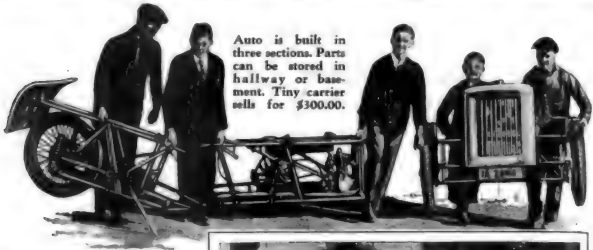
American furniture makers now have a secret chemical which is fed into the trunk of a growing tree to color the timber to the desired shade. Valuable and rare woods can be imitated much more successfully with this method, the sap-dispersed dyes carrying the minutely divided coloring matter into the grain so as to defy detection.

Ester Riso demonstrates the use of dry ice which is 109 degrees below zero F., and boils violently if placed in pitcher of water.

ture material of the future was exhibited for the first time at the chemical show—woods colored in the growing tree. There was shown the device whereby Fritz von Behr, German scientist, impregnates the sap of birch, beech, maple and other trees. A number of holes are bored around the trunk, about four feet from the ground, and others in the larger roots. Rubber piping extends to these holes from a metal container hung some twelve feet above the ground. A secret chemical is fed to the sap in early spring, and being carried to every part of the tree, completely dyes the wood.

Experiments carried on by von Behr and his student assistants at the University of Maine have produced various colors which seem to deepen with age. Every portion of the wood is tinted the same shade, and the colors are said to be unaffected by acid or water. Buttons, umbrella handles and similar articles are carved from this wood, and need only polishing to be ready for sale. The dyes are said not to injure the tree.

German "Midget" Car Can Be Taken Apart in 20 Minutes



Auto is built in three sections. Parts can be stored in hallway or basement. Tiny carrier sells for $300.00.

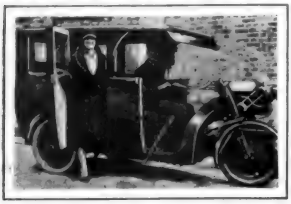
The "come-apart" car is shown above in its three main sections after being speedily dismantled.

Here is a view of the "midget" auto set up ready for driving.

THE well known German engineer Zaschka has invented a new "midget" automobile which is designed for speedy dismantling for storage purposes. The car can be "knocked down" within 20 minutes into three main sections which eliminates the necessity of a garage for storage. The sections can be stowed away in hallways or basements. The "come-apart" car is a three wheeler which is priced at but $300. It is capable of a speed of from 25 to 30 miles an hour.

New Type of Taxicab in Service

QUITE an aid for congested districts is this German three-wheeled taxicab, recently exhibited in motor shows in Europe. The cab is very easy to handle in traffic.



Man-Cat Has Thumb and Finger

RECENT arrivals at the London, England, zoo include two of the remarkable man-cats of Madagascar, known in that island as "aye-ayes" because that is the plaintive cry which they give in the forests at night. Even in their native island these animals are rare and none have been in captivity elsewhere for years. With about the size and appearance of a domestic cat, including a long bushy tail, the aye-aye is not really a cat but a lemur, belonging to a class of creatures related to men and monkeys and reputed to be not far from the line of man's ascent by evolution. A glance at the man-cat's feet is enough to suggest this, for instead of the usual cat claws the aye-aye's "hand" has four fingers and a thumb, exactly like a human hand except that they have claws instead of nails.

Above is an artist's conception of the newly invented speed boat with circular fins expected to minimize friction and propel the submarine shaped craft at a high rate of speed past the fastest of ocean liners, making the Atlantic crossing in 30 hours with 125 passengers as well as the crew. The model tests are reported to have given very surprising results.

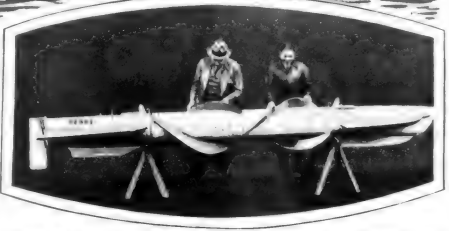
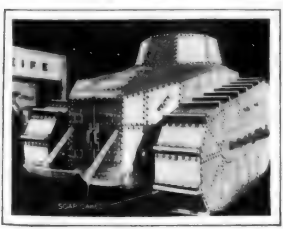


Photo of Moyne and Clement with their recently modeled speed boat.

Replica of Tank Is Made of Soap

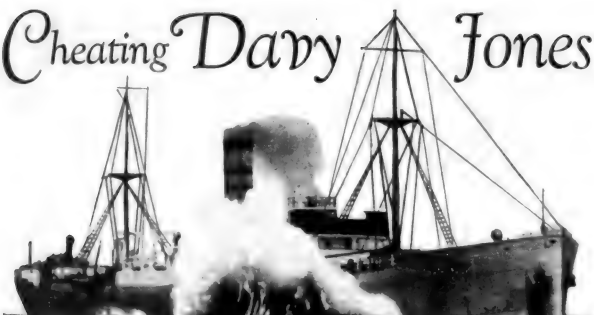
ONE hundred and thirty pounds of soap were used in the construction of a replica of a giant army tank at a recent soap exposition in Berlin, Germany. Cakes and slabs and sheets of soap were used throughout, pieces of soap being carved down to small knobs to represent hundreds of rivets in carrying out the details of the work. Happy soldiers maintain it would be an easy task for an army equipped with such soap tanks to "clean up" any opponent.



Soap used in building replica of army tank.

MESSIEURS Moyne and Clement, French inventors, have devised a remarkable new type of speed boat with circular fins that they expect will propel their new submarine shaped craft across the Atlantic ocean in 30 hours. The model of the craft is being put through tests. There are stabilizing fins at the bow and stern. The principle of operation included two helices rotating in opposite directions to counteract torque. The surfaces of the craft that offer friction are designed to do useful work, the helices minimizing the skin friction present in the ordinary boat hull. The inventors of the new boat which they have dubbed "Venus" anticipate that the full sized craft will accommodate 125 passengers as well as the crew. There will be comfortable cabin space for the passengers in the low riding boat which the inventors expect to skim the surface of the ocean expediting passenger, mail and express transport of the seven seas. If perfected, this invention would be one of the greatest achievements in the realm of transportation. The inventors visualize many of these strange appearing craft speeding across the ocean cutting the tops of waves and flashing by the present-day fast liners on their missions of commerce.

Cheating Davy Jones



The steamer Evanger being beaten by the waves off the coast of southern California. She was saved.

By H. H. DUNN

Captain Whitelaw, dean of salvors, wrested nearly 300 ships worth $50,000,000 from savage seas. He here tells of many ingenious means of raising ships and the dangers encountered.

MORE than sixty years ago, a boy of twenty, sitting on the rim of a drydock in San Francisco Bay, saw a small vessel rammed and sunk only a few hundred yards away. He had been working about a year as a carpenter on the drydock, putting on patches, stopping leaks, doing rough work with hammer and nails and saw. It was his first job, taken when he landed, a tenderfoot from New England, inside the Golden Gate. He knew nothing of the top of the sea, far from its bottom, but when the one diver in San Francisco died trying to save the sunken schooner, he rented his diving suit, went down and stayed down four hours on his first trial, patched the broken hull so that it could be towed into the drydock, and received $200 for the job. A professional diver would have received $1000.

There was made the greatest ship-salvor

Captain T. P. H. Whitelaw, who in 63 years has salvaged 290 ships and hopes to make it 300.

of them all. Combining his knowledge of carpentry with a speedily acquired skill in diving, the then "Tommy" Whitelaw began a career, not yet ended, in which he has rescued more vessels from the sea than any other man, living or dead. He is today Captain T. P. H. Whitelaw, still in San Francisco, known from Point Barrow to Sydney and from Seattle to Shanghai, up and down and across the Pacific, as the record "lifter" of sunken and stranded ships.

Under his magic hands, 290 hulls have been saved from destruction. Entering on

# of Three Hundred Ships

One of Captain Whitelaw's salvage divers actually experienced the thrilling encounter with an octopus as pictured above. The diver hacked off some of the tentacles, rescued the body, and escaped.

his eighty-fourth year, he plans to "make it an even three hundred." He has returned more than $50,000,000 worth of property from the sea to its owners, and vessels he salvaged half a century ago still are moving up and down the trade-lanes of the seven oceans. His long, black, cutaway coat and his huge "iron hat"—he buys them by the dozen—are as well known on the Embarcadero or on California street, in San Francisco, as they are on his own tugs and barges. He never has regarded a wrecked ship as a "loss" unless she went down in water so deep that his divers could not reach her, and in his sixty-three years of beating the hungry sea, he has failed to return to their owners only three vessels of all those he has attempted to save.

"The problem of all ship salvors, and, strangely enough, the underlying principle of the saving of all vessels, is to make the wrecked hull float itself," said the captain. "Wrecking tugs and barges cannot get sufficient 'purchase' on sand or rocks, or surface of the sea to lift several thousand tons of water-filled hulk. It is, therefore, necessary that the ship salvor do the same thing the ship builder did, i. e., create an artificial buoyancy *within* the hull sufficient to make the vessel lighter than the water whose space she occupies. His task is ten thousand times more difficult than that of the ship designer or builder. In each wreck, the salvager meets a different problem. I never have seen two wrecks exactly alike, and the salvager must be able to devise, quickly and surely, new methods for each condition, remembering that he may succeed only by making the hull lighter than water.

"They told me I could not save the oil

This great vessel was stranded on rocks off Alaska's treacherous shores.

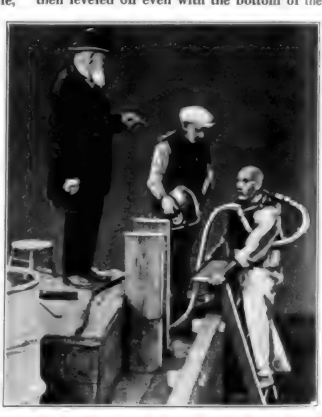
tanker, 'Rosecrans', which went on a reef off the Oregon coast, with loss of twenty-five men, but I did save her, and with peculiar methods which would not have salvaged any other ship unless it had been in exactly a similar position. Waves rolled continuously over her topmast, one hundred and forty feet up from her keel, so that at times we could not see her at all from the barges which we brought up for the rescue.

"About ten feet of solid stone pinnacle, about ten feet wide at the base, projected into the tanker's hull, holding it firmly on the reef, yet giving the heavy seas just the resistance they needed to batter the ship to bits in a very short time. The situation was full of danger for the 'Rosecrans' and of peril for the salvors. The stone spike could be reached only from the inside of the hull, but the opening into the particular tank in which the reef projected was too small to admit a fully-uniformed diver.

"The only way to move or save the tanker was to remove this rock. After long study, during which I walked over every foot of the sea-drenched deck, with a lifeline tied about my waist, I put a small amount of dynamite under one of the deck plates, directly over the rock. This plate was lifted enough by the explosion to enable four of my men to take out the bolts, and, working between waves, slip the plate to one side.

"Then the diver went down through this hole, sawed his way through the iron wall of another tank (really a bulkhead), and then he finally reached the big stone needle. For four days, he worked, with drill and hammer, driving seven small holes into this rock. In these he inserted small charges of dynamite, one-quarter of a stick to each hole. Wires were carried to a control box on my wrecking steamer, and when I pressed the switch, the pinnacle was blown up, gently and with only a muffled report, *inside* the hull. The ship was not damaged by the blast, but the rock was so shredded that it could be removed with pick and shovel, and placed at one side within the ship. I venture this is the first, possibly the only, time in which a stone obstacle to navigation was removed from the inside of a vessel.

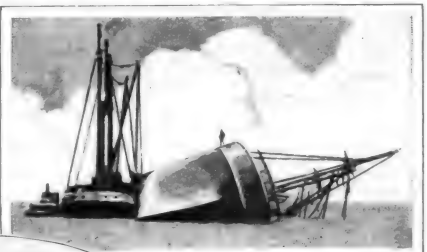
"The top of the base of the pinnacle was then leveled off even with the bottom of the



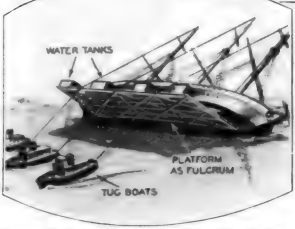
Captain Whitelaw sends one of his divers down.

hull, and steel plates shaped to fit and bolted into place. Finally, we got her in tow, and took her to a dry-dock. Thus, with dynamite, cement, steel and pumps, a $250,000 ship was saved for many years' more work on the sea."

The element of personal danger never is absent from the work



In raising this ship, breaks in her hull were closed with timbers and cement until she floated on her side, then the derrick barge passed lines to her masts and the tug, next to the barge, drew in the lines with her strong winches.



Captain Whitelaw schemed this method of righting a ship, the platforms providing a fulcrum for the lines and the water-filled tanks aiding.

of the ship salvor. On one occasion, when Captain Whitelaw was supervising the raising of a small vessel, sunk in Puget sound, the diver called for an extra line. This was passed down, retained a few moments by the undersea worker, and the signal given to haul up. When the line was pulled in the dead body of a man was attached to it. On a second signal, the diver came up, towing another short line, to which was fastened the body of an octopus with 12-foot tentacles. The diver's story was that he had encountered the devil-fish, standing on its tentacles, over the body of the man. With his long, sharp, narrow-bladed spade, he had attacked the octopus, which stood on three tentacles and fought him with the others. He finally succeeded in chopping these off, one by one, with the exception of a single 'arm', which gripped him about the middle.

Drawing his shark-knife, the diver at last severed this tentacle, though the piece, about five feet long, wrapped round his waist, had to be pulled off after he had been hauled onto the ship. Meanwhile, the devil-fish refused to leave its prey, and it was not until the diver, one Gluberson, had chopped into its body that he was able to attach the line to the dead man, who, by the way, never was identified.

As may be imagined from these incidents, the diver in this work is a highly-specialized workman, as well as an independent technician, who frequently is confronted with under-water problems which he must solve, instantly, without reference to higher authority. He is paid from $25 to $50 a day, rarely works more than four hours, unless it is imperative that a particular piece of work be completed at once, when he may remain below six hours. And the supply of men competent to do this diving is always far below the demand. Such men not only are the highest trained of all divers, and the most capable, but they also must be able to handle explosives; cut, fit and place steel plates after they have burned holes in hulls; mix and place cement under water; and do all manner of heavy carpenter work at all depths to 100 feet. They also must be familiar with the principles of ship-building, have at least elementary knowledge of hydrostatics, and be able to estimate quickly and accurately the strength

Divers and Dynamite Help Reclaim Many Ships from Ragged Reefs

This coasting steamer on a reef off the Oregon coast drove a sharp point of rock ten feet through her hull but was salvaged as illustrated in the picture at right.

of bulkheads, plates and supports necessary to withstand water and air pressure.

"I recall vividly the most thrilling salvage job of my 63 years of work on top of and beneath the sea," Captain Whitelaw said, "and it was not out in the ocean, but on San Francisco Bay. The full-rigged ship 'Blairmore', British by registry, suddenly turned over and sank, while lying alongside the dock. For some time, the cause of her disaster was a mystery, but it afterward developed that the stevedores, in removing her cargo, failed to substitute ballast in the lower holds. Her topheavy masts, beaten by a sudden wind, coupled with an unusually strong tidal current, tipped her over as neatly as if she had been picked up and dropped, masts down, into the water.

"When I was called in, 'Blairmore's' deck was completely under, and only a small section of her keel, amidships, was visible, rising like the back of a huge whale, from the surface of the bay. This situation presented still another problem in salvaging, and one which had to be solved immediately, both to save her owners from heavy expense, and to get the ship out of the way of other vessels wishing to use the same pier. The vessel had to be righted before she could be pumped out; because, if we pumped her out, the air, rising inside her, would keep her floating, keel uppermost, in spite of anything we might do to right her.

"I took two hours out to study the situation. The result was that we built, on the exposed part of the hull, a little to one side of the line of the keel, a platform, running lengthwise of the ship, and extending out about 40 feet, at an angle of 45 degrees. This, as you doubtless have seen, formed a long and powerful lever, with the water on the same side of the ship as a fulcrum. If we could

While waves beat the ship a diver dynamited a pinnacle of rock inside the hull by using small shots. Then the hull was patched.

apply enough 'power' — that is to say, weight— to the outer end of this lever, we could turn the ship over. So, at the outer end of the platform, we built four, large, water-tight, wooden tanks. Divers then attached strong lines to the three masts on 'Blairmore', well down toward their ends, near the bed of the bay, and carried them to three tugs, on the side opposite our 'lever'.

"We then pumped water into the tanks, and as we bumped, the tugs pulled on these lines. Slowly the ship turned, on her longer axis, as if rolling in a trough, or on

bearings, until the tanks on the end of the platform-lever were touching the surface of the bay, and the ship rested on her side, instead of on her masts. Then the tugs moved up closer, held her by her masts, while we emptied the tanks and moved the platform further up the hull, toward the deck. By pumping water into the tanks again, we lifted her until she was half-way righted. Then we pumped some of the water out of her hold, leaving merely enough to give her ballast to counterbalance her lofty masts, and she slowly came up to an even keel. Thereafter she was towed to shallower water, re-ballasted with stone, her masts repaired, and she was towed to the dock again, where her outbound cargo was stowed, and she went on her way. So far as I know, she still is in service, though

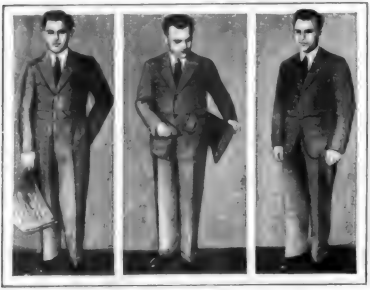
A bad crash forward necessitated the cutting off of the bow of this vessel, and the partitions were put in and backed by concrete walls before the bow was removed. Then she was towed to dry-dock where the above picture was taken before repair work started.

Captain Whitelaw has saved many steamers grounded like this one.

she may have been lost, or left the seas before the economic pressure of steam-driven vessels."

But there are times when the best efforts of the most skilled ship salvors go for naught. The mighty hand of Neptune reaches into the midst of the most carefully prepared plans and seizes the vessel even while the salvage gangs are at work. There was the big ship, "Drumbarton", wrecked on Point Pedro, on the California coast. Captain Whitelaw's fleet of tugs and barges, and his small army of divers and salvagers gathered around her. There was nothing particularly difficult about the job in hand, since the ship was hard and fast on a point of rock, which was firmly wedged into her hull. It was a matter of breaking out the rock, patching the hole, pumping out some of the water, and towing the vessel to dry dock. Suddenly and with no previous groans or cracklings, there came a thunderous crash and the hull split across and lengthwise, the parts falling into the sea.

Combination Sports and Street Suits Made in Germany



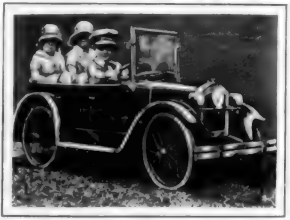
Sport suit, left, speedily becomes the street suit shown at right.

A SUIT which is equally suitable for street wear and sports has been innovated by the tailors of Berlin, Germany. The change can be performed in a few seconds. Some Germans are partial to the one-piece sports suit and enterprising tailors schemed a one-piece suit with belt and lapels. From that step it was comparatively simple to arrange a strip-off garment to form the lower part of the coat. This coat-tail garment with pockets is buttoned on just beneath the belt to make the sports suit adequate for street wear. Various stages of the transformation are pictured at the left. A similar garb for women has been devised with knickers and skirt.

Artificial Earthquakes Planned

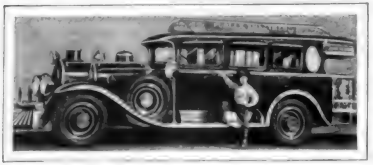
ARTIFICIAL earthquake waves, sent through the ground as geologic scouts to see what rocks will be encountered, are to be used to determine whether or not a railway tunnel can be dug underneath the Strait of Gibraltar, to connect Europe and Africa. Many plans for dams, bridges, tunnels and other structures across these straits have been urged for years, economists asserting that direct railway communication would quicken enormously the development of northern Africa. Some months ago a Spanish engineer officer, Colonel Pedro Jevenois, prepared new plans for such a tunnel. The narrowest part of the Strait is less than nine miles wide but bottom conditions in this region are not considered favorable.

Tiny Steam Car Goes 10 m. p. h.



BILLY OLDS, Jr., two and one-half years, is the proud possessor of this steam car which he can drive at a speed of 10 m.p.h.

Novel Limousine-train Resembling Locomotive Travels the Highways



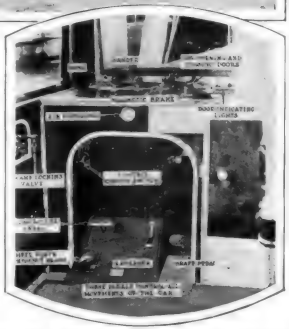
Novel limousine is capable of traveling 5 to 75 miles an hour.

A THEATER corporation has placed on the highways a "trackless locomotive," which is also called a limousine train. The car is equipped with radio receiving sets and microphone for speaking. It was especially designed and built at a cost of $25,000. It has a special four-speed transmission, a special clutch and a straight-eight motor.

Engineers Perfect an Electric "Automobile" Trolley Car

This trolley car has foot control similar to automobile driving leaving operator's hands free.

THE newest achievement of the electrical engineer makes it possible to operate an electric trolley car just as the chauffeur drives an automobile. Now the trolleyman steps on the gas, pushes his foot down on the brake pedal and otherwise employs his feet leaving his hands free for other use and emergencies thus increasing speed in handling traffic and enhancing safety. The car is electrically equipped and operated throughout as easily as an automobile. There are four sets of brakes, one set known as track brakes which clamp down upon the steel rails between the trucks, adding a new safety factor. The car is powered by four 35 h.p. electric motors and is operated at a decrease of 20 per cent in running time compared to older cars.

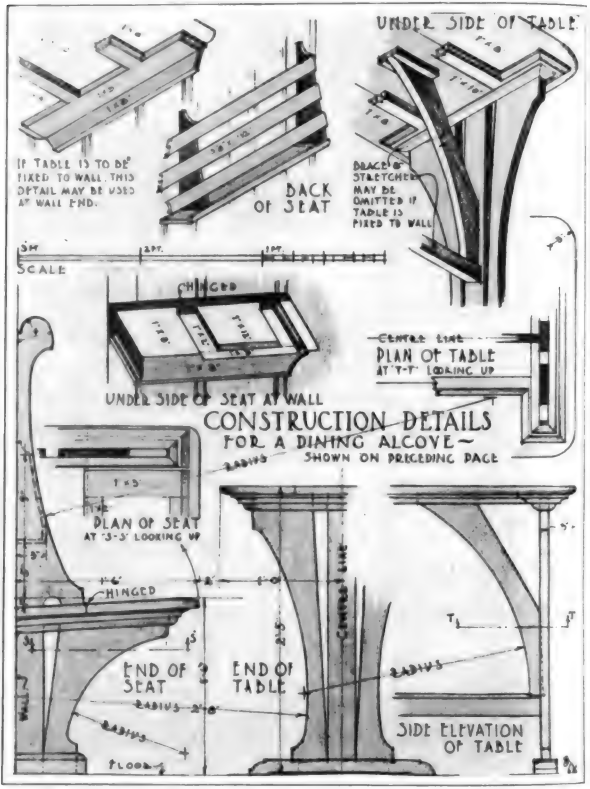


Control compartment of the new trolley car.

Automobile Sleigh Develops Speed of 35 Miles an Hour on Snow Roads

LESTER COBB, of Norway, Maine, has invented an automobile sleigh which will not mire in ruts or drifts of snow. It drives and operates like an automobile. A paddle arrangement gives it traction. The autosleigh is geared for rapid traction and 35 m.p.h. is a comfortable speed with it. It is declared that the deeper the snow the faster the speed of the sleigh.

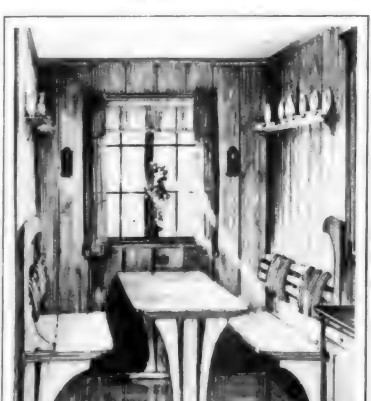
You Can Build This



Working drawings for constructing a breakfast nook in your home. Dimensions can be altered slightly to conform to the space you have available. Note how the back of the seat also serves as an attractive magazine rack. Four persons can be served comfortably in this dining alcove.

Breakfast NOOK

At an expense of but a few dollars, you can build an attractive and convenient dining alcove for your home from plans presented herewith. A breakfast nook is one of the latest conveniences in house design, and even if your home was built before they came into fashion, you can easily bring it up to date.



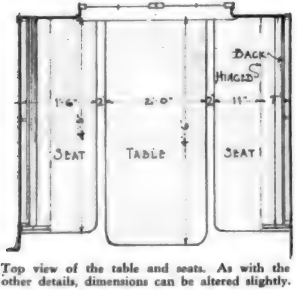
Coziness and intimacy are charming features of this attractive breakfast nook. It achieves a feeling of seclusion characteristic of a private dining compartment, and its cost is slight.

NO modern home is complete without that triumph of modern efficiency, the breakfast nook. Just because your house was built before the quick lunch room idea was annexed to the kitchen is no reason you can't have a nook of your own, for here's one you can build. This one is designed to fit a space five feet four inches wide and four feet six inches deep, but the dimensions can be changed to fit your individual needs. Some breakfast nooks are being fitted into old fashioned pantries, and others are created with shoulder height walls, like the semi-private booths in some restaurants, with a table or cabinet against the wall to accent the "nookiness" by creating an artificial corner.

In the nook we are illustrating, the architect has created a separate room effect by covering the walls with wood paneling, giving a sharp contrast to the plaster and paint of the kitchen itself. The paneled walls are ultra-modern, and quite cheap. Ordinary clear sheathing—clear, that is, of knots and blemishes—has been used in random widths, the corners being beveled off to give a moulded effect and accent the joints. Stained in a soft shade of natural wood stain, or shellacked and varnished, you get an effect that interior decorators charge high prices to achieve. The plate rails above the seats are so simple no directions are needed. And note the two-socket electric fixture over the table, to provide for the coffee urn and toaster.

Now for the table and seats. The working drawings show all the details. If you want a natural wood finish, pine, cypress, oak, or any of the lumbers carried in stock sizes can be used, providing some care is taken to select lengths that are free from blemishes and that have an attractive grain. If, however, you want a splash of bright color, the thing most people are seeking these days, you don't have to be so careful about grain, and any good grade of pine will do, with the added advantage that it is easier to work. Decorated in contrasting colors with the new quick drying lacquers, with, possibly, flowers or similar applied designs in colors, you will have a breakfast alcove that will compare with the best.

All of the details of construction are



Top view of the table and seats. As with the other details, dimensions can be altered slightly.

shown on page 92, and for convenience in translating the dimensions into full size working plans you will find a three foot scale, with one foot divided into inches.

The table top is built up from three one inch boards, four feet six inches long, two of them eight inches wide and the third ten inches. That gives a twenty-six inch wide table, which can be retained full width, or reduced to twenty-four inches when you round off the outer edges—it all depends on how much room you have. The three boards for the top are held together by one-by-three-inch battens, screwed on from the bottom, and finished off on the outer edge by a narrow stock moulding, which can be obtained in a variety of designs from any lumber yard. The drawing showing the under side of the table, in the upper right hand corner of the working drawing page, gives a clear idea of the assembly.

There are two ways of building a breakfast nook table. One is to fasten the inner end of the table top to the wall, and the foot of the leg under the outer end to the floor—which gives a solid construction—and the other is to use legs at both ends, with a stretcher and braces. The detail of the underside of the table shows the stretcher and brace, while in the upper left corner is detail for a wall fastening, which will eliminate one leg.

The leg, or legs, are formed from three boards, one a 1x3 inch piece for the center, and the outer two 1x8 inches, cut as shown. The foot is three inches wide and 2 inches high, and the legs are mortised into it to a depth of half an inch, and fastened through the bottom with long wood screws. A box of 1x2 inch strips, around the top of the leg, finished off with a simple moulding, enables you to secure the top, using wood screws from the underneath side.

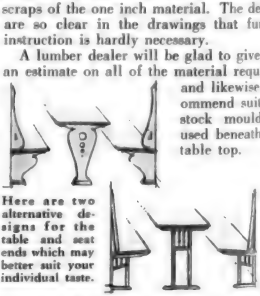
The legs for the seats are formed in much the same manner, cut from a three inch and a twelve inch width of one inch material. The seat itself is of two boards, the inner one 1x8 and the outer 1x12. The outer board is hinged, so that it can be raised to enable the housewife to sweep under the seats. Before the inner board is attached to the legs the end is fastened to it with screws from the bottom, and when all is in place the end is then secured to the walls with long screws, counter-sunk and the holes filled with putty or plastic wood.

The hinged portion of the seat is reinforced by 1x3 inch cleats at the end and 1x2 inch strips running lengthwise, the front one being grooved to carry out the moulding effect. Or a narrower strip can be used and faced by a length of the same mouldings.

The Back Rest

The back rest, an attractive feature not only for the comfort it gives, but because the small cushions, covered with bright cretonne or similar material, add a splash of color of their own, is built like a magazine rack, and offers a convenient place for the morning paper or a magazine. The three slats are ¾ of an inch thick and 1½ inch wide, and the three supports—one for each end and a third in the middle—are cut from scraps of the one inch material. The details are so clear in the drawings that further instruction is hardly necessary.

A lumber dealer will be glad to give you an estimate on all of the material required, and likewise recommend suitable stock mouldings used beneath the table top.



Here are two alternative designs for the table and seat ends which may better suit your individual taste.

World's Largest 'Chute Can Be Guided

The world's largest parachute, 85 feet in diameter, shown above is capable of lowering a stalled airplane safely to the ground. The cap at the top is really a second chute for guiding the big spread.

Heard McClellan, inventor of the huge parachute, is shown inspecting the container for the chute which will be carried under the fuselage, while the ropes of the chute will be fastened to the top of the plane. At the right is a retouched photograph showing a parachute lowering an airplane.

HEARD McCLELLAN, inventor of the world's largest parachute, designed to safely lower a stalled airplane to the earth, is at work perfecting his newest chute. The chute which is 85 feet in diameter, with an area of 4,455 square feet, is carried in a container under the fuselage while the ropes are fastened to the top of the ship. The chute has a "cap" in the center which can be permitted to fill out like a second chute and rise above the main chute releasing air for a faster drop to regulate the landing.

The drawing shows how the audience is led to believe that the girl performer is inside the inner cabinet through the use of artificial hands, when in reality she has slipped unseen through the back drop ready to reappear at the back of the theater, walking through the aisle among the audience.

By R. D. ADAMS

The Mechanic Who Made Houdini's Trick Magic Apparatus

In response to numerous requests from readers who enjoyed his thrilling articles, concluded in the December Modern Mechanics, telling of the methods by which Houdini, the master magician, performed his tricks, Mr. Adams has given us another interesting "behind the scenes" story. He built much of Houdini's apparatus.

HARRY HOUDINI possessed every faculty and every facility for being the master magician of all times. He owned the greatest library on magic ever assembled. And he read and reread these tomes until it is unlikely that there was ever a major magic act of which there is any modern record whose secret he did not know or at least which he could not duplicate by some ingenious method of his own and make a decided improvement upon the original.

Fond as Houdini was of making escapes personally before his audience, he took an equal interest in causing his assistants to disappear.

A clever act he used for a time was of English origin. A small cabinet was let down from the flies by means of ropes and a young woman stepped inside. Curtains hanging from a wire supported by four posts were drawn about the cabinet. The audience saw the young woman reach through the curtains at each of the posts in front of the screen and help adjust them. A moment later, the ropes were pulled and

TRICKS EXPLAINED

the screen, which plainly had no flooring in it, was whisked up above the stage.

Again the hands were seen apparently readjusting the curtains around the cabinet. Then Houdini fired a pistol and the curtains fell to the floor. The girl had vanished. Where was she? She answered the question herself almost instantly.

"Here I am," she cried gaily as she walked down the theater aisle displaying on her wrist the signature of a committeeman, which had been placed there at the beginning of the performance to prove that a "double" had not been used.

How did she vanish? There was a heavy rug on the floor which showed no trap door was used. She could not possibly have clung to the interior of the screen and been lifted into the flies. And if she had done so, she could not have gotten out and down into the theater aisle so quickly. Like all the others, the trick is simple enough once the method is known.

The first time the hands appeared to adjust the curtains quite ostentatiously, they were those of the young lady. But immediately after they were drawn back, she stepped around the screen and vanished back stage through a slit in the drop, her exit being hidden by the curtain and screens.

The hands that were seen at the curtains after the screen was hoisted were artificial. Fine silk lines made invisible against the dark background and operated from the flies caused the artificial hands to move as if adjusting the curtains and then to disappear behind the posts so they would be invisible when the curtains dropped. When Houdini saw his assistant at the rear of the theater ready to rush down the aisles, he fired the pistol for the removal of the curtains and the illusion was complete.

When the cloth is draped over the supposed figure of the girl, she is in reality resting on a shelf at the rear of the table, and the shape of her body is simulated by springs which collapse at the pull of a release wire—a mystifying disappearance!

The last time I was with Houdini, he outlined a new trick he had in mind and asked me to make him a model of the simple contraption needed to make it possible.

Here is the trick as it would have been worked had his plans been carried out:

A long table would have been placed in the center of the stage and a wide plank with hooks at each corner would have been placed across it. A young woman would have lain down on the plank and a thin piece of cloth been thrown over her in such a fashion that the body outline would have been clearly visible to the audience. Then the plank would have been raised a few feet from the table by means of ropes let down from the flies, the table would have been trundled off the stage by an assistant, a shot would have been fired, the plank lowered again to its original level, the cloth removed and the young lady would not be

Escaping from Sack Without Trace

In escaping from a paper bag, Houdini cut his way out with a razor blade and sealed the edges of the cut with gummed tape melted with a hot iron, leaving no trace of his manner of exit.

found beneath it. Instead she would be rushing down the aisle calling, "here I am," as in the act just described.

And it undoubtedly would have been a most mystifying performance—this disappearance from a plank suspended in midair and nothing above, below, or at the sides of it to veil her escape.

As a matter of fact, however, she would not have been on the plank when it was elevated above the table. As the cloth was being thrown over her, she would have rolled out on a shelf at the rear of the table and been trundled out with it. A portion of the top of the plank would have been covered with light canvas so stained that the audience would not have detected the deception. Beneath this canvas, held tight by elastic but so arranged that it would give at the slightest pressure, a set of springs would have bulged up so as to create the impression that the audience could see the outline of the girl's feet and torso beneath the light covering thrown over the plank. When the shot was fired, a jerk from an invisible cord would have released a trigger causing the bulging springs to snap back into position and the top of the plank to appear smooth and level.

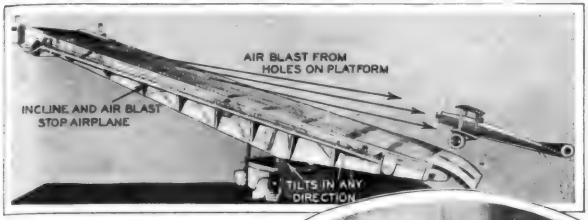
Another stunt was the escape from a paper bag. Houdini was enclosed in a bag after which the opening was tied and sealed so that it could not be opened from the inside without certain detection. The moment he was trundled behind the screen where he made all his escapes, Houdini took a razor blade from his pocket and drew it at an angle across one wall of his paper prison. Stepping out, he reached into one of the secret compartments of his screen where there is transparent mending tissue and a flat iron. Placing the tissue carefully inside the slit, he fitted the paper tightly together, warmed the iron over an alcohol lamp if he did not have an electrical one available, smoothed out all wrinkles perfectly and returned before the audience. The committee members inspect the bag. Strangely enough they invariably devote practically all their attention to ascertaining whether the bag is sealed as it was when they last saw it, satisfy themselves that such is the case, give a cursory glance at the rest of the sack and finding no gaping holes therein, shake their respective heads solemnly and depart convinced along with the rest of the audience that Houdini is a phantom.

An old trick which Houdini revived was that of "threading" a package of needles in his mouth.

Houdini's method of presenting the act was to place in his mouth a number of needles, one at a time, then draw through his lips a long piece of thread. A few minutes later after which he had stalled with appropriate movements of his facial muscles to indicate he was forcing the thread through the elusive eyes of the tiny bits of steel, he drew out slowly before his bewildered audience a thread so long that an assistant had to take hold of one end of it long before it had all passed through his lips. On it at irregular intervals were threaded 150 to 175 needles.

The long strand of threaded needles neatly rolled together had been secreted carefully between his jaw and cheek. As he took the loose needles in his mouth, he worked them down on the other side of his jaw where his dexterous tongue also forced the piece of thread the audience saw him take into his mouth. His agile fingers removed the loose needles and thread, which he palmed, as he started to draw forth the threaded needles.

Runway for Airplanes Atop Skyscrapers



Photograph of the model "landing field" invented for use atop skyscrapers in metropolitan centers.

A NEW YORKER has invented a novel turntable runway which he believes will be suitable for landing and take-off of airplanes from the tops of high buildings. The device is declared to offer many advantages over the proposed platforms for such landings. The landing table can be tilted at any angle and swung about in any direction so that the wind is along its axis. The incline naturally serves as a brake on the landing ship and air blasts assist in checking the speed of the landed ship. The turntable would also present an incline which would enable a faster than ordinary take off.

Artist's sketch of turntable runway enabling airplane landings and take offs from building tops.

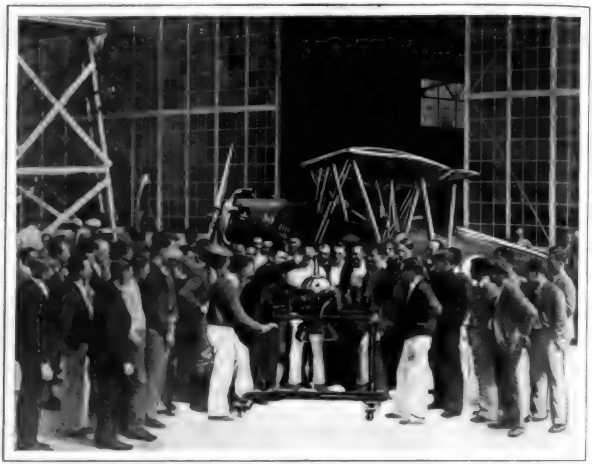
Salt Mines Beneath Detroit

ONE OF the largest salt mines in the United States lies 1100 feet beneath an important industrial section of Detroit. Here from 1,400 to 1,500 tons of industrial salt are mined every day. Despite large scale operations there are enough salt deposits to last over 100 years. The salt, which is blasted loose by dynamite, is hauled by a labyrinth of small-gauged railroad tracks, more than five miles long, which winds through the mine. Huge electric shovels dump the salt, after it has been dynamited, into special flat cars which carry it to the enormous hoists that lift it to the surface of the earth where it is crushed for shipment. To protect the lives and health of the workmen in the mine a 20-foot ventilating shaft in a special building on the surface drives 40,000 cubic feet of fresh air into the mine every minute. A series of fans within the mine distributes the air.

New Finish for Aluminum Found

A NEW, simple and economical method of giving aluminum a dead white finish is described by Leon McCulloch, research chemist of the Westinghouse Electric and Manufacturing company, in a report to the American Electro-chemical society. Under the new method of preparing aluminum the metal is boiled in milk of lime to which a little calcium sulphate has been added.

Become a PILOT



If you want to join a class like this and without any expense learn to fly an airplane, be sure to read about this fifth contest of a series of twelve conducted by Modern Mechanics magazine.

DO YOU envy the young man who so confidently climbs into the cockpit of an airplane, signals to his mechanics, and with engine roaring glides down the field and then sails off into the sky, master of his ship and master of the air? If you do here is your chance to become a pilot and it will cost you only two cents—the price of the postage stamp necessary to mail your entry in Flying Contest No. 5 being conducted by MODERN MECHANICS magazine.

The rules of the contest are simple. They are printed in detail on the opposite page. Read the instructions carefully and then enter the contest to become the fifth pilot trained free of charge by this magazine. There are six questions about aviation scattered through the advertising section of this issue of the magazine. Each question is numbered and easy to find. Answer the questions, fill out the entry blank, enclose a camera picture of yourself and send your entry. It's as simple as that.

Fred Resico was the first boy to be awarded a free flying course and the other winners will be announced as soon as the judges complete their survey of the entries. There will be seven more monthly contests but the wise men aren't waiting for the last one, they are entering now.

The winner of first prize will be sent to one of a number of qualified flying schools. His railway expenses will be paid in full. While he is in training his living expenses will be paid and all expenses incident to the flying course will be paid. The winner will also be given a helmet and goggles. All other necessary equipment will be supplied at the expense of MODERN MECHANICS. The winner of second place will be given a

at OUR EXPENSE

Here is your fifth chance to win your wings with Modern Mechanics paying all expenses. This magazine is offering twelve free courses in flying, one being awarded each month. The rules are on this page.

leather air-mail helmet and the winner of third prize will be awarded a pair of non-shatterable goggles.

Flying instruction will be given by licensed transport pilots using dual control ships of the latest type which are regularly inspected for airworthiness by federal officers. The lessons will be available at whichever of the following schools is nearest the winner's home: Shaw Flying School, Minneapolis, Minn.; the Von Hoffmann Aircraft Co., St. Louis, Mo.; the Aviation Engineering School, New York; and the Western College of Aviation, Los Angeles, Calif.

Ever since it was founded MODERN MECHANICS has been aggressively supporting aviation. It believes wholeheartedly in the future of aviation; in the future of the airplane for the individual. In supporting its firm convictions the magazine is doing what it can to meet the demand of the industry for more trained pilots. The magazine has undertaken to pay the entire expenses of teaching twelve young men or women to become pilots. One is being selected each month in a series of 12 monthly contests. This is the fifth. There will be seven more but you are urged to enter now.

American airplane factories are producing ships more rapidly than training schools are graduating the fliers capable of handling those ships. New airlines are constantly being opened and the opportunities in this great and adventuresome new industry are constantly increasing. Are you going to let your opportunity slip through your fingers and go on dreaming but not flying? Or are you going to fill out the entry blank today and seek the free training course which is now being offered to you?

If you are 16 years of age or more and a resident of either the United States or Canada, in good health, willing to try, you are eligible to enter this contest or any one of the subsequent contests. There is nothing complicated about the simple requirements which are announced on these pages.

You have dreamed of great accomplishments and longed for adventure. The youthful pilots of today will be the veterans of tomorrow making new marks in the skies, pioneering in the development of one of the greatest industries imaginable. There will be adventure galore and here is a wonderful chance to win your wings without reaching into your pocket for a single dollar.

RULES OF THE CONTEST

Scattered through the advertising pages of this issue of Modern Mechanics you will find six questions dealing with aviation. For the best letters containing answers to these questions, as determined by the contest judges, prizes will be awarded as announced elsewhere on this page. Neatness, originality, and adequacy of answers will be guiding factors which will help the judges determine the winners.

Anyone may compete who is 16 years of age or over, and a resident of the United States or Canada. Members of the staff of this magazine are, of course, not eligible to enter. Address your letter to Flying Contest No. 5, Modern Mechanics magazine, 501 Seventh Avenue South, Minneapolis, Minn. Entries must be postmarked not later than March 1, 1930, to be eligible for this contest. Clip or copy the entry blank below and attach it to your letter. Fill in the information requested. Include a snap shot of yourself, if possible—a big photo isn't needed; just a kodak print.

It is not necessary to buy a copy of the magazine to compete. In case of a tie, duplicate prizes will be awarded. Fill in the entry blank, find and answer the six questions, and send in your entry now. Don't forget to include your photo!

ENTRY BLANK

My name is .....

Address .....

Age ..... Height ..... Weight ..... Sex

If under 21, please answer the question below:

Will your parents consent to your learning to fly? .....

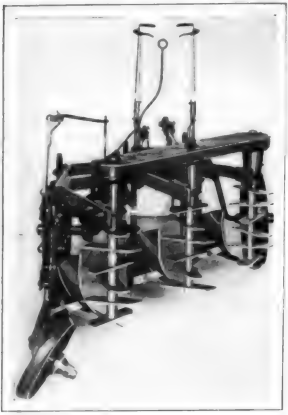
Parent's signature .....

Attach your answers to the six questions, and your photo, to this blank. Mail before March 1, 1930, to

FLYING CONTEST NO. 5

MODERN MECHANICS MAGAZINE, 501 SEVENTH AVE. SO., MINNEAPOLIS, MINN.

Implement Plows, Harrows and Discs in One Operation



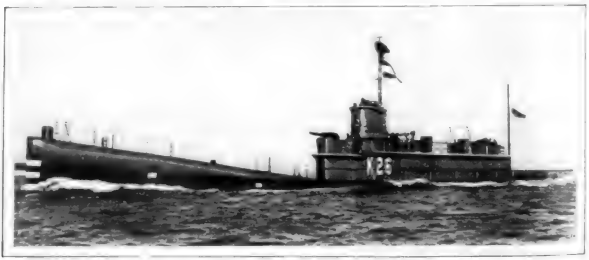
This farm implement perfected after years of trials will plow, harrow and disc at the same time. The ten-inch blades attached to the shafts pulverize the soil by making 525 revolutions per minute doing the pulverizing just as rapidly as the soil is turned up by the shares. This plow breaks up all stalks and stubble and mixes them into the soil without leaving air spaces.

J. B. DAVIDSON and E. V. Collins, of the Agricultural Engineering Department of Iowa State College, Ames, Iowa, have invented a plow which plows, harrows and discs at the same time. The principle of this plow is not new, but it has never been brought to perfection before until the inventors, after three years of experimenting, have reached the goal of their ambition. This plow is briefly described as follows: By the side of each plow share is a shaft to which is attached a number of 10-inch blades which rapidly revolve and pulverize the soil as fast as it is turned up by the shares. The advantage of bringing the soil into such condition is apparent to any tiller of the soil.

The blades make 525 revolutions per minute and receive their power from a take-off shaft connected with the engine of the tractor. As no air spaces are thus left in the soil the roots of growing plants are able to come into contact with the soil. This unique plow breaks up all stalks and stubble and mixes them into the soil. After the field is plowed it has the appearance of one that has been freshly harrowed, so fine and even is the soil.

It has been calculated that this plow requires only from 10 to 15 per cent more power than an ordinary plow. By combining the three operations of plowing, harrowing and discing in one process it is expected there will be a great saving of labor.

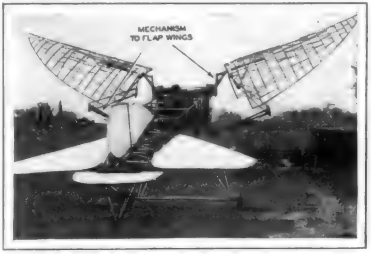
England's Newest and Largest Submarine Is Tested at Portsmouth



The K 26, England's latest and largest submarine built by Vickers of Barrow, and completed at Chatham, England, is shown above undergoing one of her trial trips at Portsmouth. She is much larger and has many other improvements than the old K designs.

New Flying Machine Patterned After Structure of an Owl

AS THE result of intensive study of the flights and structure of heavy birds, Robert Myers, of Rockford, Ill., has designed and built an ornithopter from which he expects to develop ideas for further experiments with such ships. The strange ship has wings criss-crossed with rib structure and hinged to the body in such a way that the wings can be flapped to propel it. Myers, like many before him, believes that it may be possible to learn secrets of flight from birds that will enable man to perfect highly developed flying wings; a type of aircraft radically different from the rigid type of winged ships now in use.



Myers in wing flapping ornithopter without wing covering.

Young Hound Stands Seven Feet

BRIAN, thoroughbred Irish wolf hound, only eleven months old and still growing, measures seven feet from toes on the ground to his nose in the air when his master, J. G. MacKenzie, of Lima, Ohio, holds up his forelegs.

Brian is eleven months old and still growing.

Ancients Had Calendar Reforms

TWO OF the world's newest proposals for calendar reform, the 13-month year now being advocated by American business men and the five-day week which is to be introduced in Soviet Russia on January first, both were in use by the first known American civilization, that of the Maya race which lived in Central America more than two thousand years ago and some of whose cities were rediscovered recently by Colonel Lindbergh. So said Dr. Herbert J. Spinden, who recently joined the staff of the Brooklyn Institute of Arts and Sciences, in an address before the Amateur Astronomers Association of New York City. The calendar of the Mayas began its time count, Dr. Spinden stated, on August 6, 1613, B. C. From that day henceforth the calendar never lost even one day until 1561 A. D., when the books and records of the Maya empire were burned by fanatical Spaniards as supposed works of the devil. No other time-counting system in the world's history has so perfect a record. The Christian calendar accumulated an error of 11 days in less than 2000 years, when it was arbitrarily reformed and the present calendar established. The ancient Maya calendar, Dr. Spinden said, could have run for 300,000 years before it accumulated an error of one day, while even our present calendar will run only 3300 years before it gets to be one day wrong. The five-day week which the Russians believe that they have invented was one of the established time-counts of the Maya system, Dr. Spinden said.

SAILING with SKATES

By SAM BROWN

For real thrills there's no sport like skate sailing, says Mr. Brown—and he goes ahead and proves it in this article. Moreover, he gives you plans for building your own sail and full directions on how to operate it when it's finished.

Here we have a demonstration of the right way to hold the sail. Note that the backbone rests on the shoulder, wind pressure keeping the fabric against the body.

HERE he comes—there he goes!

Just like that! Like saying "Jack Robinson!"

And thrills. . . Man!

Maybe you've felt the smooth gliding swiftness of skating. And the flying sensation of skiing. And the speed of ice yachting. And the fun of tobogganing. But if you've left out skate sailing, then you've missed the grandest sport ever dished out by Old Man Winter.

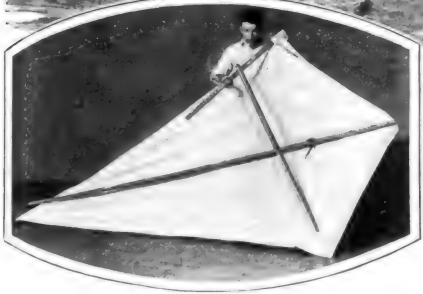
You don't have to be a wonderful skater, or a good sailor, either, to go skate sailing. All you need is the equipment, the necessary expanse of slate gray ice, and a moderately strong pair of ankles; and then if you hold the sail—any way you please—you are bound to glide off in one direction or another.

The first thing required for skate sailing—supposing that you already have the skates—is the sail. Ready-built sails can be purchased at moderate cost at any large sporting goods store, but you can make one of your own from the directions which follow. You don't have to be an expert sail maker to do a good job, and the only tools required will be found in even the most scantily equipped home workshop.

You'll get a good idea of the size and appearance of the sail from a glance at the photo of the sailor, above, and the sail itself on the page opposite. Dimensions for a good-sized sail you will find on page 107. Before we go into detail on how to make the sail, it will be well to get a clear idea of what you're going to make. The fabric is cut in the shape shown in the dimension diagram. Lengthwise through the center will be run a wooden backbone; at the bottom of the sail a cross piece will be needed, and a cross spar will be placed two feet from the tip of the sail to support it at its broadest part. The cross-spar will be built in two pieces, adjustable to varying lengths to keep the sail taut as a drum. Now let's begin.

The very first operation in making the sail has to do with the making of the backbone. This is a piece of 1¾-in. Half Round (you can get this stock cut at any lumber yard), 9-ft. 6-in. long. To one end of this, and on the rounded side, screw a ½-in. eye-screw. Two feet from this eye, nail a 10-in. leather strap. Take another strap and cut it in two a short distance behind the buckle; then nail the plain portion to the other end of the sail backbone. The

is Great Winter Sport



Skate sailing is an especially thrilling sport when half a dozen fellows get together, as in the above photograph, and race over the ice. You'll find that skill in manipulating the sail counts for a lot in speed sailing. At the left is a view of the partially completed sail. The cross spar which the man is holding is made in two parts which bolt together.

strap will be your means of securing the cross-spars to the backbone.

Now, consider the sail! Material for this can be either three-ounce zephyr cloth, three-ounce duck, Egyptian cotton, balloon silk, or any other light, strong material. The sail can be made in one single piece or it can be ribbed together from three or four smaller pieces. At any rate, the shape of the finished cloth should be as shown in the diagram—hemmed all around as shown. Get a ⅝-in. washer and sew it to the top of the sail, reinforcing it on either side with a triangular piece of heavy canvas or light leather, as pictured on page 106. Punch out the cloth or leather in the center of the washer so that it can be fitted over the screw-eye at the tip of the backbone.

Jumping down to the other end of the sail: Take a 3-ft. 9-in. length of 1½-in. Half Round and insert it into the wide hem, tacking it firmly in place. To the center of this spar, nail the buckle end of the strap mentioned a few paragraphs back.

The cross spar for the sail is made from two pieces of 1¾-in. Half Round. One of these pieces is 3-ft. 6-in. long; the other 5-ft. 2-in. long. Bore a ¼-in. hole through the center of the shorter piece. At one end of the longer piece, bore a similar-size hole, and then another, and another, and another—each spaced 1½-in. apart. All of this hole-drilling business has to do with one thing—they figure in the stretching of the sail.

Like this: Take the two pieces and fasten them together with a bolt and wing nut, running the bolt through, say, the next-to-the-end hole, as shown in the photograph at the top of page 106. Now you can get the whole business—the finished sail and how this cross spar serves as a stretcher. Hook

This closeup shows the method of constructing the two-piece cross-bar. Use a wing bolt fastening to hold the parts of the spar together. Four or five holes are drilled through which to fit the bolts. When the sail stretches, the spar is lengthened by running the bolts through different holes.

the washer at the top of the sail over the screw-eye at the end of the backbone. Pull down the cross spar so that the two pieces cross, and then insert either end into reinforced canvas pockets which should be sewn to either side of the sail. Hook up the secondary stretcher at the bottom of the sail, pulling it as tightly as possible; then bring the cross spar into line, fastening it securely at the center with the leather strap. You can readily see that the spar stretcher is adjustable. By inserting the bolt into the various holes you can make the cross bar either shorter or longer as you desire. The sail must be drum tight—it is only with a "drum" on your shoulder that you can get the true "slap" of a brisk breeze set loose by the Old Man up north.

Now, with the sail all made, you're ready for the real fun. If you've ever sailed a boat you'll know just how to get best results, for the sailing technique is the same. Your skates have just about the same effect as the rudder on a boat. All ready, now:

Skate out on the ice, holding the sail at arm's length over your head, both hands grasping the cross spar, so that the sail presents the smallest possible area to the wind. Then, bring the sail upright against your right side, resting the long backbone spar on your right shoulder. Your right hand should grip the long spar, while your left takes hold on the cross bar. The sail is between you and the wind.

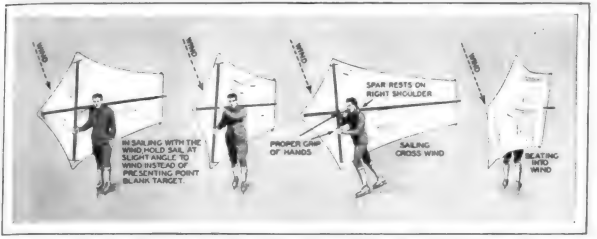
Away you go, directly across the wind, your skates biting into the ice and preventing you from "drifting" sideways. If you want a bit more speed, simply swing around so that the wind is more to your back. And listen: Never hold the sail as a point blank target to the wind. And why not? Simply because the skate sailor travels faster than the breeze.

F'rinstance: Supposing there is a seventeen mile wind blowing. The inexperienced sailor, thinking to take full advantage of this, holds the sail directly at his back, presenting a point blank target to the breeze. The result is that he is swished off, and gradually increases speed until he is going about twenty-one and one-half miles per hour. What happens, then, to Mr. Seventeen-mile-an-hour breeze? It cannot keep up with the sailor, and there is a sudden vacuum behind the sail which is often of such intensity as to cause the sailor to lose his balance.

The *correct* way to sail before the wind

The tip of the sail fits over a screw-eye, a reinforced opening being provided by a metal ring around which leather is sewn.

Position of Sail in Relation to Wind Holds Secret of Speed on Skates

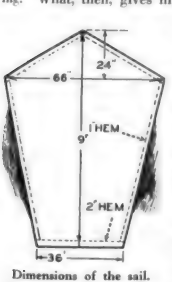


This diagram gives the amateur skate sailor a few pointers on how to get best results. Note how the bite of the skates in the ice enables skater to sail across the wind, giving the effect of a rudder.

is to hold the sail at a slight angle away from the breeze, so that you zigzag down the wind instead of scudding directly before it.

Now, let's imagine that you want to get back to your starting point. The first thing to do is to change the position of the sail, as this must always be carried between you and the wind. To do this you swing around into the wind, which frees the sail from your body, then quickly lifting the sail flat over your head you lower it on the opposite side of your body.

In beating into the wind, as illustrated by the diagrams, you will notice that the push of the wind tends to send the sailor toward the bottom of the page—in other words, in the same direction the wind itself is traveling. What, then, gives him his motion almost directly into the wind? His skates? They bite into the ice and act in the same capacity as a centerboard on a sailing canoe in holding the sailor on his course.



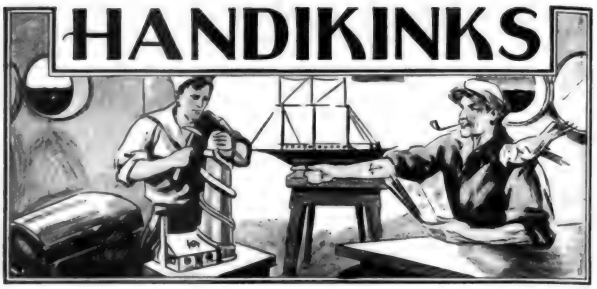
Dimensions of the sail.

Suppose you want to sail directly into a north wind. You'll have to do it by "tacking," as sailors term it. First cover a fair distance on a northeast course. Then, swinging the sail to the opposite side of your body, start on the opposite tack—that is, to the northwest. By alternating these two directions, you will eventually arrive at your destination—due north.

From this you can readily see that the type of skates you use has a great deal to do with your success in this maneuver, for the greater the "bite" the skate runner has on the ice, the easier it will be to sail into the wind. Long skates have the preference. Many Canadians use the huge Norwegian skate with its 24-inch blade. American choice leans toward the 15-inch speed skate. The individual's choice is more or less a matter of "what have you?" You can enjoy great skate sailing sport on a pair of semi-hockeys or on even shorter skates if they are sufficiently sharp.

Why doesn't the sail blow you over, you ask? Maybe it will, until you learn the trick of balancing yourself by leaning against it. Perhaps you've seen sailboats heeled over by sudden gusts of wind, and the same thing can easily occur to a skate sailor—but that's where much of the sport comes in. The knack of holding the sail at the proper angle to get best results comes with a little experience. When you want to stop, swing about facing the wind and bring the sail flat above your head, a position in skate sailing which might be said to correspond with neutral in an automobile. In case of a collision with other sailors you can always let go of the sail.

HANDIKINKS

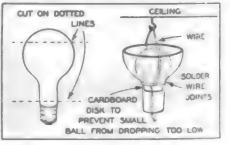


Short cuts in performing everyday tasks—novel methods of using waste products for useful purposes—suggestions for improving household efficiency —all such "handikinks" appear regularly in this department every month.

Simple Catch From Old Ford Spring Holds Cellar Door Securely Open

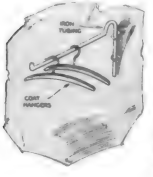
MOST cellar doors open inward, with the beams of the floor extending over the door, as shown in the drawing at the right. When carrying out ashes and doing other work around the cellar, it is frequently desirable to have the door propped open, yet an object placed at the bottom of the door is likely to be tripped over. A leaf from an old Ford spring, attached to the door and shaped as shown, will hold the door open against the roof beam. The temper should be removed from the spring by heating before bending.—Willis Johnston.

A Light Bulb Twine Holder for the Kitchen



A BURNED out electric light bulb of large size makes an excellent holder for a ball of twine, dispensing string without tangling when wanted. The ends of the bulb are cut off as shown in the drawing at right, using an ordinary glass cutter. A cardboard disk is placed in the neck of the funnel to prevent the twine ball from dropping through when it becomes of small diameter. —Lester P. Young.

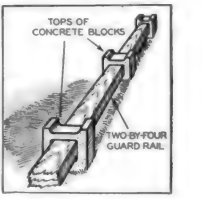
Coat Hanger Swings Out of Way When Not in Use



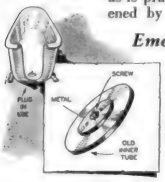
A COAT hanger arm that swings out of way when not in use can be made from a piece of iron tubing or bar, and two large eyescrews. The tubing is bent in the shape shown in the drawing at the left and is mounted to the wall of the clothes closet by means of the eyescrews, through which it fits loosely. The arm may be swung about in a semi-circle, or even removed entirely if desired, since it fits loosely in the screws. Eight or ten clothes hangers can be placed on the arm, depending on the length you choose to make it.—Ray Champion.

Ideas For The Home "Fix-it" Man

Concrete Blocks and Two-by-Four for Guard Rail



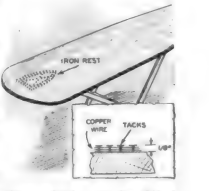
AN EASILY erected guard rail for lawns and along driveways is constructed of concrete blocks and two-by-fours. The concrete blocks are sunk into the ground for about half their length so that the top holes in the blocks are slightly above the level of the grass. Through these holes are placed lengths of two-by-fours, the ends of which butt together in the center of a block. The blocks can be placed as close together as is practical. The two-by-fours can be fastened by cementing.—Richard H. Robinson.



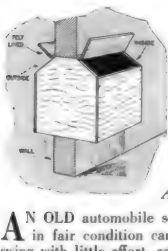
Emergency Stopper for Bathtub

SOMETIMES the drain plug of the bathtub or cellar sink gets lost or damaged in such a way that it is of no further use, and an emergency stopper is required. On such an occasion a circular piece of rubber cut from an old inner tube can be pressed into service. Take a piece of light metal, as near as possible the diameter of the drain, and screw it to the rubber as shown in the drawing at left.—Theodore Allen.

Tacks and Wire Make Safety Rest for Hot Irons



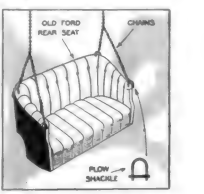
A HEATED iron may be left indefinitely on a board equipped with a safety rest as pictured at the right. A box of tacks and a length of copper wire are all that is required. The tacks should be of the long-stemmed variety with broad, flat heads. Draw an outline of its shape on the board. Following this line, drive in the tacks close together, with the heads about an eighth of an inch above the board. Wind wire around the tacks to offer a smooth edge.—Iva Belle Allan.



Built-in Two-Way Woodbox

A CONVENIENT and novel woodbox which can be filled from outside the house is shown in the drawing at the left. It is a particular convenience for the kitchen or the hunting cabin. Any dimensions can be used to fit individual needs, for it consists simply of a box mounted in the wall of the house with half its area outdoors and the other half inside. Hinged lids on either side keep the box closed when not in use. Felt lining for the lids keeps out the cold.—Ruth Weber.

Auto Seat Makes Porch Swing



AN OLD automobile seat in which the upholstery is still in fair condition can be made into an attractive porch swing with little effort, as shown in the drawing at the right. The frame of the seat is made of wood through which you can bore holes for the installation of shackle bolts, as shown. Four shackle bolts hold the chair in suspension by means of chains attached to the roof. The seat can be bought cheaply from any auto wrecking establishment, in case you do not already have one. A coat of paint and a bit of refurbishing make the swing quite presentable.—William Swanberg.

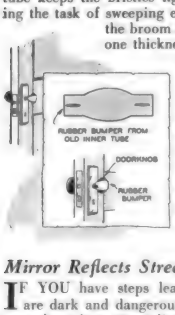
Household Efficiency Stunts

Screen Door Catch Is Good Holder for Bulky Mail

A SCREEN door catch of the rubber roller and spring type obtainable for a dime at any hardware or ten cent store makes an efficient holder for papers, large letters, and other bulky mail too large to fit into the regular box. The drawing and photograph at the left show how the catch is mounted directly underneath the mail box, pointing down. Mail is slid beneath the rubber roller and the tension of the spring holds it against the wall of the house. A stiff wire ring attached near the rubber roller will facilitate raising it for insertion.—W. E. Burton.

Broom's Life Lengthened by Use of Tube Tightener

THE useful life of a broom can be greatly lengthened by wrapping a piece of automobile inner tube around it as shown in the drawing at the right. When placed in this position the tube keeps the bristles tight, not only preserving them but making the task of sweeping easier. The tube can be wrapped around the broom several times, or it may be cut apart and one thickness only used.—Ray Champion.



Bumper Protects Against Banging Doorknobs

IN MANY homes the doors are so arranged that in some instances, as in narrow hallways, knobs of opposite doors bump against each other when they are opened at the same time. To prevent the scratching of the knobs in such instances, an effective rubber bumper can be made from a discarded inner tube after the manner shown in the drawing at the left. Two slots are cut on opposite sides of the rubber piece. The doorknob is unscrewed and the slots fitted over the handle.—T. S. Asgaard.

Mirror Reflects Street Lamp to Light Dark Step

IF YOU have steps leading up to the back porch which are dark and dangerous, this little stunt will be helpful in case there is a street light quite close to the house. Place a mirror on a tree or specially erected post so that it will catch the light from the street. Erect it at such an angle that the reflected beams will play upon the bottom step, using "stolen" light from the street lamp.—A. L. Neuenschwander.

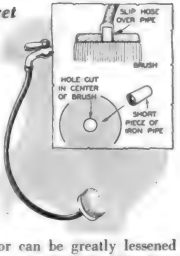
Simple Basement Shower

BY TAKING the garden sprinkler and attaching it to the basement ceiling as shown in the drawing at the left, connecting the garden hose piping with the hot water tap from the laundry tubs, you will have a shower bath at slight cost. If water from a home water heater is used, the shower will gradually taper off from hot to cold as the water in the tank is used, which prevents catching cold.—Dale R. VanHorn.

Helpful Items For The Home

Dish-Washing Brush Connects Directly to Faucet

DIRTY dishes can be washed easily with a brush connected to the water faucet by means of a rubber hose as shown in the drawing at the right. Secure a round brush with a wooden back and stiff bristles like those of a scrub brush. Cut through the center of the back a hole large enough to admit a short piece of lead pipe so that it will fit tightly. The pipe is fitted into the end of the hose and made tight by winding with wire. The other end of the hose should be equipped with a screw nozzle for easy connection with the faucet. This is especially helpful for restaurants.—Lloyd Kutz.

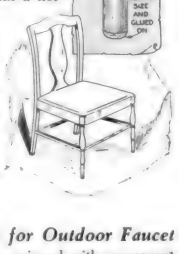


Cushion for Screen Door

THE annoying slamming of a door can be greatly lessened by the means shown in the drawing at the left. The door closer itself can be bought for ten cents, but it closes the door with a bang. By fitting a hollow rubber ball, such as a tennis ball, to the top door sill so that the door strikes it on closing, this bang is prevented. A small hole in the ball permits the air to escape slowly. Make the holes for the screw with a red-hot wire slightly smaller than the shank of the screw, and the air hole with a hot needle.—Dick Cole.

Corks on Chair Legs Prevent Injury to Floors

SCRATCHING chair legs need not mar the surface of hardwood floors in the dining room or parlor. By fixing the chair leg bottoms with cork tips, they can be slid easily around without damage to the floor varnish. The ordinary chair can be fitted with large bottle corks, obtainable at any drug store. Pieces are cut to fit the legs and glued to the bottoms. A large piece of bulk cork is best to use in fitting irregularly shaped legs. The cork tips should be from one-fourth to half an inch in thickness.—Upsher Reeves.

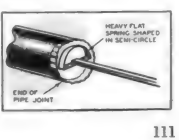


Doorknob Is Handle for Outdoor Faucet

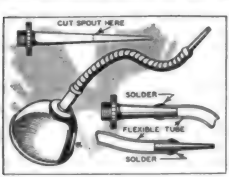
OUTSIDE water faucets equipped with permanent handles are sometimes a source of trouble through the ease with which children can turn them on as Hallowe'en pranks. An ordinary doorknob makes a good handle for these faucets which can be removed when not in use. If the regular faucet handle is removed a square shaft will be uncovered which will fit the doorknob.—Wesley Hewitt.

Stovepipe Cleaner Made From a Clock Spring

A PIECE of old clock or talking machine spring bent into a half moon shape and mounted on the end of a stick, as shown at right, will make an excellent scraper for cleaning out the soot in a stovepipe. This method prevents the damage which sometimes results when the pipe is pounded.—L. Young.



Hints For The Home Workshop

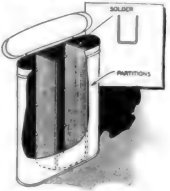


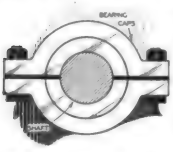
Attaching Flexible Snout to an Oil Can

BY PURCHASING a six or eight-inch piece of flexible metal hose you can equip an ordinary oil can with a flexible snout at a considerable saving over the cost of a new flexible nose can. Saw off the spout of an ordinary copper oil can as shown in the drawing at left. Solder the flexible tubing between the two pieces of the spout. The resulting oil can will be equal to the three dollar article.—T. S. Asgaard.

Compartments in Can Keep Drills in Good Shape

SMALL drills have an unpleasant habit of getting lost or becoming dulled when thrown in loosely along with other tools in the portable kit. An empty tobacco can furnishes the ideal solution to this problem. Fashion a U-shaped partition out of a flat piece of metal, as shown in the drawing at the right. This should be as wide as the thickness of the tobacco can. Solder the partition to the edges of the can as shown. This will provide three long compartments of just the right size for accommodating drills.—Herb Singer.



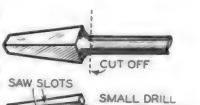


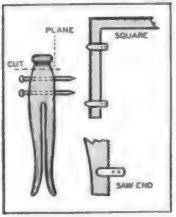
Connecting Rod Bearing Caps Make Shaft Collars

CONNECTING rod bearing caps of the Model T Ford (or of any other car) can be used as light collars on shafting. The drawing at the left shows how they are installed for such use. If the bearing caps do not fit the shaft, they can easily be made to do so by rebabbitting to the correct size. The fact that they are split makes it possible to install them without dismantling the shaft.—W. T. Claytor, Jr.

Adapting Bit Shank to Hold Small Round Drill

THE tapered square shank of an ordinary bit that has been discarded may be salvaged as an adapter for using very small round drills in an ordinary bit brace. The shank is cut off and a hole is bored through about three-quarters of its length with the drill to be used. Two hack-saw cuts at right angles are now made through the shank to the same depth that the hole was bored. The drill is inserted and held firmly when the assembly is tightened in the brace.—Lester P. Young.



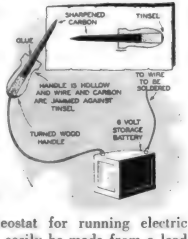


Clothespins Make Wall Racks for Holding Tools

IN BUILDING a tool chest or making arrangements for hanging tools on the wall of the workshop, ordinary clothespins can be used to advantage. One edge of the pin is planed off flat so that it will fit securely against the wall. The head of the pin is cut off to present a neater appearance. The pin itself can be tacked in the desired position by means of small brads. The resulting wooden clip is of just the right size and has sufficient springiness to hold securely such articles as saw and square.—Gregory Moon.

For The Electrical Experimenter

Small Electric Soldering Iron Runs From Battery

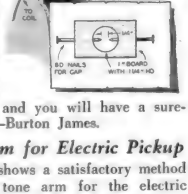


AN ELECTRIC soldering iron is a handy article to have around the workshop. You can make yourself one at slight expense. Take a piece of carbon of the type used in arc lights and whittle it down to a diameter of about a quarter inch. Mount it in a hollow wooden handle, as shown in the drawing at the right, the bottom half of which is filled with tinsel. Run a wire from the storage battery into the tinsel and fill the whole assembly with Le Page's glue. Run another wire from the battery to the wire you wish to solder.

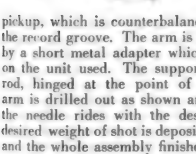
Pencil Emergency Rheostat

EVER want a slow-starting rheostat for running electric trains or other toys? One can easily be made from a lead pencil. Remove sections of the wood from the pencil, as shown in the drawing at the left, exposing the lead core. Wire the lead of the pencil to switch posts arranged in an arc as shown. The end of the lead pencil is connected to the battery, while the switch lever is hooked up with the train circuit. The lead in the pencil furnishes varying resistances.—Crosby Wirth.

Safe Electric Flashlight Gun



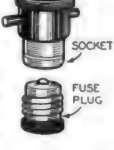
IN TAKING flashlight photographs a safe form of gun for exploding the powder at a distance is greatly to be desired, yet most amateurs are unable to afford the type of gun used by professionals. A simple substitute can easily be made from a piece of inch board, into which a shallow depression is bored to receive the powder. Drive two nails through the board so that their tips project into the powder opening, with a gap of a quarter inch between them. Connect the ends of the nails with wires leading to a spark coil, and you will have a sure-fire, safe flashlight gun.—Burton James.



Home-Made Tone Arm for Electric Pickup

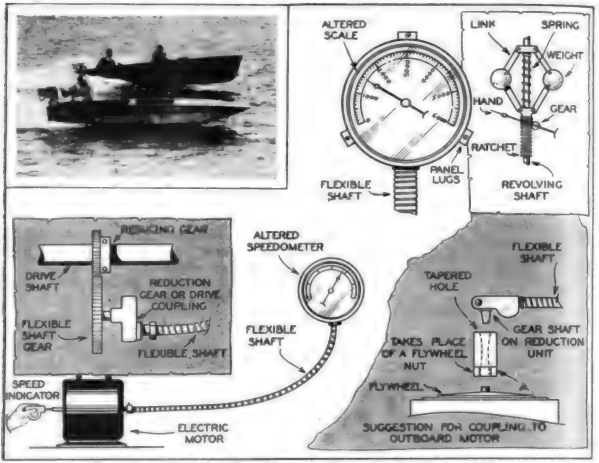
THE drawing above at left shows a satisfactory method of providing a separate tone arm for the electric pickup, which is counterbalanced to take the extra weight of the unit from the record groove. The arm is fashioned from soft wood and is held in place by a short metal adapter which can be made from brass to fit the opening on the unit used. The support of the arm is a short length of metal rod, hinged at the point of connection. The counterbalance of the arm is drilled out as shown and the opening filled with lead shot until the needle rides with the desired pressure in the groove. When the desired weight of shot is deposited, the opening is sealed with plastic wood and the whole assembly finished in an appropriate color.—Luther Olds.

Fuse Plug Adapted as Electric Switch in an Emergency



SOMETIMES the small electrical shop does not have the type of pendant switch desired. One can assemble a "switch" as shown at right, using an ordinary socket and a 10 or 15 amp. fuse.—L. P. Young.

Speedometer Makes Tachometer



By using the old fashioned centrifugal speedometer with a new dial calibrated for r.p.m.'s, a most satisfactory marine or outboard motor tachometer can be built, calibrated with a motor.

POWER boats striving for speed invariably use a tachometer to keep close watch of engine speed. Such a device however costs from thirty-five to fifty dollars, thus depriving many from owning one. A very satisfactory tachometer can be made from one of those old style speedometers using a dial and hand for the reading. They operated on the centrifugal principle and are almost identical with the tachometers used in marine work. A good one can be picked up at some auto "junk" yard for a couple of dollars and by making a few minor changes, can be used to read up to 6000 R.P.M. with a fair degree of accuracy.

First take the instrument down by removing the front flange, glass, hand and then pulling the "works" from the case. Wash out all the moving parts in gasoline. Then reassemble carefully in the case all but the dial and the hand. The trip and mileage recorders can be left out as they are unnecessary. The speed of the flexible shaft, when the hand reads full speed on the dial should be stamped somewhere inside the case. Try and get a speedometer that shows a speed slightly in excess of 300 R.P.M. when the hand reads 60 miles per hour.

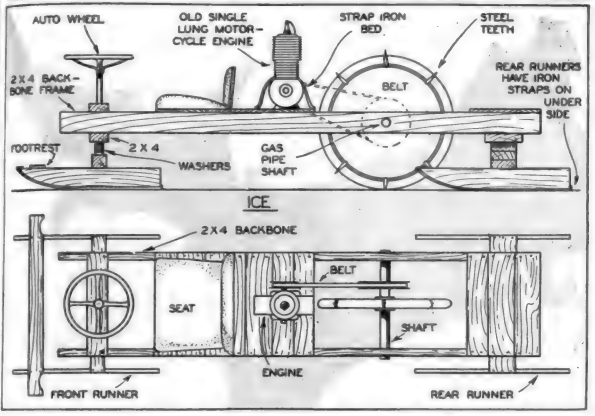
Lay the dial over some clean bristol board or thin aluminum and scribe out a second dial.

Grease and oil all the reassembled parts and then place on the dial and push the hand on lightly.

Next, the tachometer must be calibrated. This can be best done by connecting the flexible shaft directly to a source of power of known speed.

For connecting this tachometer to an outboard motor it will be well to follow the idea shown in the cut. This consists of a duplicate nut to replace the regular flywheel nut.

A Motorcycle Ice Sled



IN ALMOST any motorcycle shop there will be found a few old single-cylinder motors which the proprietors will be glad to have you take off their hands and which will furnish a satisfactory power plant for a fast motor sled. At the most you should be able to pick up such a motor for $5. Such an engine should easily develop two or three horsepower. It will safely drive an ice sled at a good rate of speed, and if you wish to experiment with pulleys the sled can be geared up into a real speed craft.

If the sled is built after the above drawing, it should cost not more than $10 to make. No dimensions are given because these will naturally vary to suit conditions. Use 2x4's for the backbone of the sled, cutting them long enough to accommodate the seat, motor frame and wheel as shown. Cross tie the frame with 2x8's where the runners are to be attached. The flooring of the frame will give it rigidity. It is best to use tongue and groove flooring which interlocks firmly and helps prevent the frame from weaving when speeding over rough ice.

Next make the runners out of some hard wood such as oak or birch. If a strip of round iron is heated and sunk into the runner it will burn a track into which it will fit snugly when fastened with long screws at either end. The cross bars should be made of hard wood to resist the strains which concentrate on these parts of the sled. The motor bed is made of strap iron and should be made to provide for a belt tightener. The motor may either be made adjustable back and forth or the usual heavy idler pulley may be used.

The power wheel is of the ordinary motorcycle type to which a number of steel teeth are added to give a firm grip on the ice. This gives the sled positive traction and makes it satisfactory to use on country roads where sleds driven by airplane propellers have difficulty in getting up speed. The seat of the sled can be made of burlap stuffed with excelsior and the steering wheel can be secured from an auto junk pile. Gas tank, coil and batteries should be mounted in a unit which you can detach from the sled as a safeguard against theft. A suggested addition to the sled is the building of a guard over the power wheel. A metal shield mounted over the wheel and tacked to the frame will remove the possibility of danger from the steel teeth in the wheel.—Gilbert Mickelson.

HOME MOVIE INVENTION Reduces FILM COSTS

THROUGH an invention which enables motion pictures to be taken laterally as well as horizontally upon the same film, it is declared the cost of motion pictures for the home has been reduced 75 per cent. The reducing of film costs was worked out by means of a camera which takes pictures crosswise as well as lengthwise of the film permitting the operator to take four pictures where formerly only one picture was taken. The new camera is expected to be on the market this year.

The new home movie and film may be shown at any time and any place, even in broad daylight with a "daylight recreator," and above is shown a demonstration of the new machine. The compact projector contains a 250-watt lamp, forced draft for cooling and with the usual 100-foot roll of film will give 16 min. entertainment.

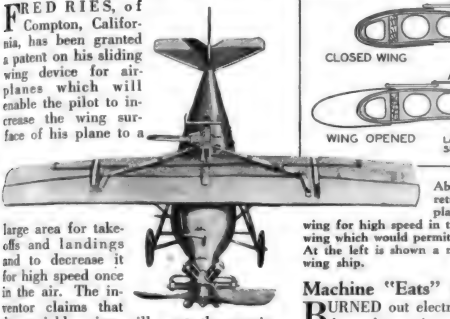
An actual reproduction of the new film with the arrow showing the order in which pictures are taken to enable considerable savings in film costs.

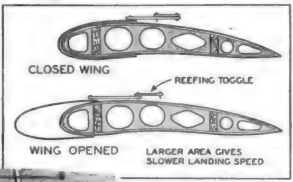
Above is shown the cabinet for the new home movie equipment with the projector on top focussing on a screen and "daylight recreator" which is a translucent glass screen.

Above is a close-up of the movie projector.

Device Increases or Reduces Wing Surface of Airplane

FRED RIES, of Compton, California, has been granted a patent on his sliding wing device for airplanes which will enable the pilot to increase the wing surface of his plane to a large area for take-offs and landings and to decrease it for high speed once in the air. The inventor claims that the variable wing will meet the requirements of aeronautical engineers for a surface sufficiently large to enable the plane to lift an enormous load from the ground and land at a very slow speed.





Above is illustrated the new retractable wing for airplanes showing the closed wing for high speed in the air and the enlarged wing which would permit a slower landing speed. At the left is shown a model of the retractable wing ship.

"Brain Music" Electrically Made

MUSIC heard clearly inside the brain although no sound waves were entering the stopped-up ears of the hearer, is a new achievement of the science of electro-acoustics demonstrated by Mr. Sergius P. Grace, assistant vice president of the Bell Telephone Laboratories. One of Mr. Grace's hands he connected electrically to a powerful vacuum tube amplifier like those used in radio receivers or electric phonographs. His assistant similarly connected one of his own hands. Each person then placed his electrified hand tight against one ear of a third person who was to hear the new "brain music", sheets of ordinary writing paper being between the operator's hands and the listener's head. Instantly, the listener reported that he could hear, loudly and perfectly, the music being reproduced inaudibly by the amplifier. The secret is, Mr. Grace explained, that charges of high-voltage electricity tend to attract anything in their neighborhood. The effect of the amplifier was to supply to the hands and paper sheets held against the listener's ears a high-voltage, alternating electric current vibrating in correspondence with the music being played by the amplifier.

Machine "Eats" Old Light Bulbs

BURNED out electric lamps which have been thrown into ashcans as worthless are now considered so valuable for salvaging purposes that a new machine, called a rumbler, has been perfected to thresh the brass shells out of this former waste. A New York company collects 300,000 incandescent lamps annually and salvages the brass ends by means of the new machine shown below. The old method of collecting bulbs and cracking them up in churns took much more time, was less efficient, and the brass ends had to be sorted out by hand.

The rumbler sifts glass from brass salvage.

Edited by MAJOR H. H. ARNOLD

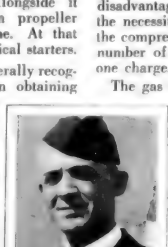
Late Production Airplanes Equipped with Self Starters

FIFTEEN or more years ago, the aviation world received quite a laugh when a French self starter company circulated the ad for their starter. It depicted a dwarf-sized man standing on a tripod starting an enormous airplane engine. Alongside it showed four giants pulling a propeller through to start another engine. At that time there were few if any practical starters.

The need for starters was generally recognized but the difficulty was in obtaining one which would be effective under service conditions and at the same time not too heavy. Much man power is wasted on airdromes by requiring the use of several mechanics to start one engine. On cross country flights it is practically impossible to find anyone among the spectators who has any idea how to pull the prop through.

Accordingly the airplane engine starter is an accepted part of all modern airplanes. These starters are classified into five general types — inertia, hand gear, electric, gas and compressed air.

The hand starter was the easiest to install, but requires more manual labor than any of the others. It is entirely similar in its operation to the hand crank on an automobile; accordingly it is not in general use.



Major H. H. Arnold is a recognized authority in the field of the airplane, being the author of a number of widely accepted text-books on aeronautical subjects, as well as a practical flyer of long standing. He served as assistant chief of the American Air Service during the World war.

The compressed air starter utilizes compressed air, carried in small containers in the plane, to run a small air motor. The disadvantages of this type are the weight, the necessity for an air pump to replenish the compressed air, and the relatively small number of starts which can be made from one charge.

The gas starter pumps an explosive mixture into the cylinders of the engine and thus causes the engine to start operating. It has the disadvantage of requiring the airplane carrying an additional fire hazard in the form of the explosive mixture supply, the impossibility of securing the mixture on cross country flights, and excessive weight.

The electric starter is made up of a small electric motor which automatically engages with the engine crankshaft through dogs or splines and a heavy battery. A disengaging device is included to prevent injury to the mechanism.

The inertia starter relies for its operation upon the rotation of a small fly wheel. This fly wheel is revolved either by hand or by an electric motor.

Gliders Launched from Airplanes Are Gunners' Targets

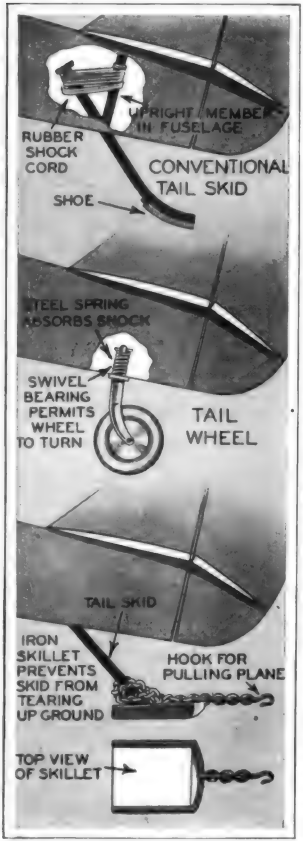
Note the 12-foot glider in its rack atop the wing of an Army fighting plane. The glider is launched in the air by the pilot of the plane, and it describes an erratic course, as shown in the drawing at left, which makes it an ideal target for practicing aerial gunners.

EVER since the World war constant attempts have been made to make aerial target practice more realistic. The main difficulty has been to secure a target which follows a course that cannot be predicted by the gunner. When two airplanes are combating, neither pilot can predict just what the other will do. Accordingly the best possible practice would be to have two pilots engage one another in mimic combat. Such practice with camera guns gives excellent training but has the disadvantage that the machine guns cannot be fired.

The ideal condition would be to have a target which has the maneuverability of an airplane and which may be fired upon by machine guns. The glider target comes closer to reaching this ideal than any other device so far brought out.

The glider target has a wing spread of about 12 feet. It is so constructed that it can be attached to the top wing of an airplane and turned loose at will by the pilot. The angle at which it rides on the airplane is such that when turned loose, it climbs steeply and eliminates all possibility of colliding with the fuselage or tail of the plane. The glider has a speed of about 55 or 60 miles an hour. After it has been turned loose from its mother plane, the target glider spirals, twists, makes half loops and steadily loses altitude until it finally lands. It is so constructed that there is considerable flexibility between the wing and body. Thus it can strike the ground fairly hard with little or no damage.

Wheels on Tail Skid Is Latest Trend of Airplane Design



The tail wheel is replacing tail skid on modern planes equipped with brakes on landing wheels.

WHEN the Wright brothers constructed their first airplane, there was no need for their giving any thought to protecting the tail surfaces of their plane, for they had skids which extended from front to rear. Other engineers experimenting at the same time and later, on account of their particular type of landing gear, were forced to provide some kind of protection for the tail of the plane during landing and while taxiing.

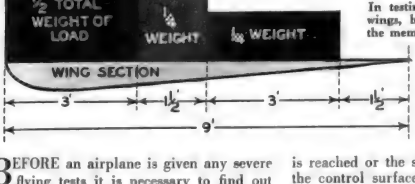
There were varying ideas as to whether the tail should be supported and protected by a skid or a wheel. Thus there were planes brought out with both. However, as the years went by and the speed of planes increased, the skid was accepted as the proper device for protecting the empennage. This was natural for, by cutting into the ground, it kept the plane on a straight course during take-offs and acted as a brake during landings.

Obviously some kind of protection must be given the skid or constant replacements would be necessary on account of the wear and tear of rocks, sand and gravel. Ordinarily the shoes are made of an extremely hard steel.

With the adoption of brakes the control features of the tail skid were unnecessary. Accordingly, today we find many planes with wheels on the tail skid. This makes maneuvers of the planes on the ground much simpler. While it has heretofore been necessary to lift the tail and place the skid on a dolly for the purpose of running a plane into a hangar, with the wheel on the tail skid the plane can be readily pushed as desired with little effort. The same flexible connection between the tail skid proper and the fuselage is required with the wheel as with the skid and shoe. Generally speaking, however, the rubber cord has now been replaced by steel springs.

One of the main objections to the tail skid has been its tearing up of the ground on the airdrome and of the aprons near the hangars. This objectionable feature has been eliminated entirely with the wheel. On some airdromes a metal skillet is used to prevent the tail skid from tearing up the ground and to provide a smooth surface for maneuvering the airplane near the hangars. This skillet has a chain attached which holds the skid tightly in place.

Airplane Wings and Fuselage Severely Tested Before Use



In testing the strength of airplane wings, bags of shot are loaded on the members in the proportions that strain will be exerted in the air. As shown in the diagram, half the total weight carried by the wing is exerted on the leading third of its chord, while the trailing edge carries no load at all.

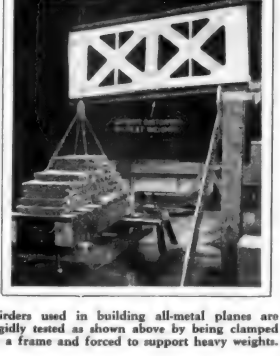
BEFORE an airplane is given any severe flying tests it is necessary to find out exactly how strong it is, the strength of its wings, control surfaces, landing gear and fuselage.

Knowing the speed of a plane and its loading, it is possible to compute the stresses and strains imposed in performing any maneuver in the air. In making static tests, the different parts of the plane are actually loaded with bags of shot to meet the desired loading. The entire plane or parts are supported in stands and the load applied. The plane is put in the stands in a normal or inverted position depending upon whether a direct or reverse load is desired.

In loading the wings the shot is distributed as shown in the diagram above, with half on the front third of the wing. On the elevators the load varies from a maximum at the hinges to a zero at the trailing edge. The shot bags are applied on the rudder and ailerons in a manner similar to that on the elevators.

The unit of load is "pounds per square foot." The normal procedure is to apply shot until a load equal to a factor of safety of 3½ or more is reached. Then measurements of distortion are taken, supports replaced and additional weight applied. This continues until the required factor of safety is reached or the surfaces give way. When the control surfaces are tested, the control cables are held rigid and support the entire load.

To test the landing gear, the weighted fuselage is raised and then dropped upon the wheels from varying heights.



Girders used in building all-metal planes are rigidly tested as shown above by being clamped in a frame and forced to support heavy weights.

HOW to EXPERIMENT

Clear view of rocket in place under model airplane. Note fire deflecting card on tail of plane.

Home-made rockets can be easily prepared and attached to almost any model airplane for successful experiments in flying rocket ships.

By KENNETH B. MURRAY

IN THE experiment about to be described, a thirteen-year-old Michigan high school boy planned and constructed a regular model airplane to which was attached a home-made rocket. After considerable experimentation in balancing the plane and positioning the rocket a sufficiently stabilized arrangement was made and the plane tested out.

The plane was placed in the middle of a city street, other smooth take-off surface not being available, and heading into the wind. A match was applied to the fuse of the rocket. A large burst of smoke first started the proceedings. Then, with a loud hissing, the plane started rolling, gathering speed within twelve feet sufficient to lift it clear of the ground. The time of the flight was almost a minute, the larger part of this being after the rocket had exhausted itself. The highest point reached by the plane was approximately 20 or 25 feet.

Filling the rocket tube with prepared powder.

Other experiments with different types of rockets and a change in the upward pitch of the wings of the plane were made, and it was found that there was "practically no limit" to the height or length of the flight, the factors being controlled by the wing pitch, size, weight, power and durability of the rocket charge.

Inasmuch as it was determined that if the rockets are made in the correct manner there was no danger of an explosion even in inexperienced hands.

With ROCKET SHIPS

Actual flight of the rocket airplane model.

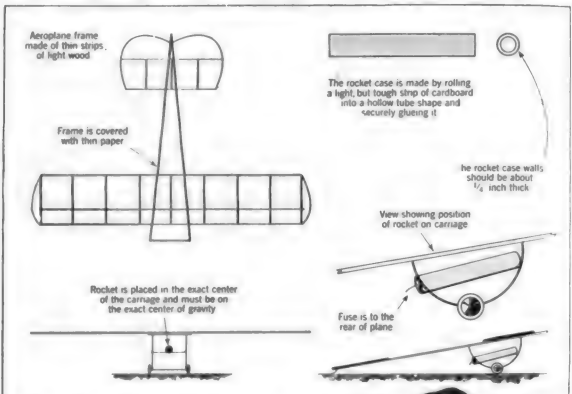
This illustration shows how the rocket should be wired to the bottom of the model airplane.

Although regularly manufactured rockets removed from a skyrocket stick and with the cone end removed assure one of success, the enjoyment of home manufacturing achievements put the home manufactured rocket plane in favor. Commercial rockets also present the difficulty of not being available in a sufficient number of different sizes and of different strengths. The home-made article can have incorporated in it the ideas of the builder and each can be made to suit the size and weight of the plane that it is to propel.

A light, tough cardboard should be secured and rolled into a tube of the desired length and diameter. The walls should be at least a quarter inch thick, and must be well pasted or glued. The powder is made of one part by volume, not by weight, of pulverized saltpeter, and one part charcoal. Each of these is non-explosive, but they must be pulverized separately. After pulverizing the materials, moisten the saltpeter, gradually adding water and mixing in a china bowl until it is a thick paste. The charcoal is then added a little at a time until all is well mixed in. To this is added about a tenth part of powdered sulphur. By the time that charcoal and sulphur have been added the compound will no longer be a paste but merely a moist compound. It should be spread out in a shallow pan and allowed to dry thoroughly, after which it is ready for use.

This powder is not explosive in the open air, merely burning slowly with much smoke. It must be confined to produce the power required to propel the plane.

Reverting to the rocket tubes, one end must be filled in with the exception of a small hole, half the size of a pencil. It was found that plaster of paris is suitable, as it can be poured into the end of the tube



Diagrams showing proper placing of rocket for successful flight of a rocket-propelled airplane. Note rocket is tilted down slightly.

and allowed to set and dry well. A tightly wound roll of paper with a hole left in the center can also be glued tightly into the end of the tube.

The tube is next filled with powder. It must then be tightly stomped down until it is as compact as possible. Fill the tube to within an inch of the top with the packed powder and then stuff in some paper scraps moistened with glue until the end is entirely stopped up. The rocket fuse is made of a very small tube of paper, filled with powder and inserted in the opening in the rear, or propelling end of the rocket.

The illustrations show how the rocket is wired to the plane, care being used to find the center of balance. It must point downward slightly to avoid burning the tail of the plane in flight. A further precaution against the plane catching fire is to line the underside of the tail with a piece of cardboard, which will not burn through during the duration of each flight.

Place the plane on a level surface with the front facing into the wind. The igniting of the fuse is done from the rear.

There will be a burst of smoke and fire at first, and the rocket will quickly roar and hiss and propel the plane forward with amazing speed. It should leave the ground within a few feet if the balance is correct. The illustration shows the experimental plane just as it has left the ground.

Lighting the fuse of the rocket airplane model.

No directions for the building of the plane are given as any flying airplane model, either a glider or rubber motored plane, should prove satisfactory.

Freak Plane Crash Caused by Settle-draft

A SETTLE-DRAFT of unusual proportions recently caused one of the most remarkable crashes in the history of aviation. The settle-draft relentlessly forced down a mail plane which was driving forward and climbing in what is usually a normal fashion but with the pilot powerless to combat the steady downward drag of the draft.

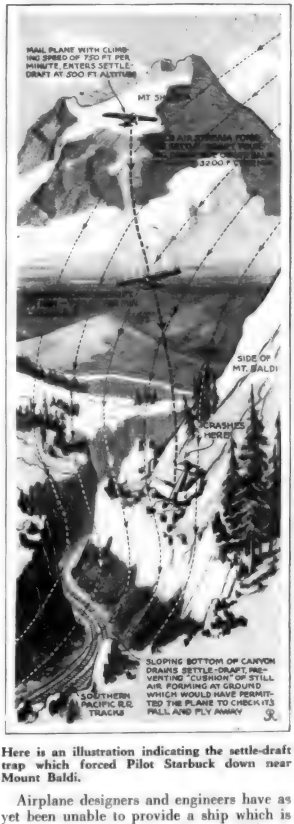
Luckily, Pilot Arthur D. Starbuck of the Boeing route, escaped without fatal injuries and so could tell the story of his experience with the grandfather of all settle-drafts and thus establish a new problem for students of aviation.

Although there was a light snow, visibility was fair when Starbuck flew along with a 30-mile headwind near Mt. Shasta. He was at an altitude of some 500 feet near the base of Mount Baldi and over a narrow canyon when he found his ship was caught in the relentless grip of the most powerful settle-draft ever reported.

His motor raced like mad and immediately his ship started to drop. The propeller spun and the motor worked with power which would usually give the ship great climbing and forward flying ability but all to no avail. The pilot was absolutely helpless in the grip of the settle-draft.

Momentarily as he dropped at the rate of 30 miles per hour, Pilot Starbuck anticipated that the ship would strike a solid cushion of air nearer the ground as is usually the case when a ship is caught in a settle-draft. He gave his motor the gun and pulled up his ship but—there was no cushion. The settle-draft was bottomless and crashed his ship full on at the base of Mount Baldi. The pilot was injured but not critically.

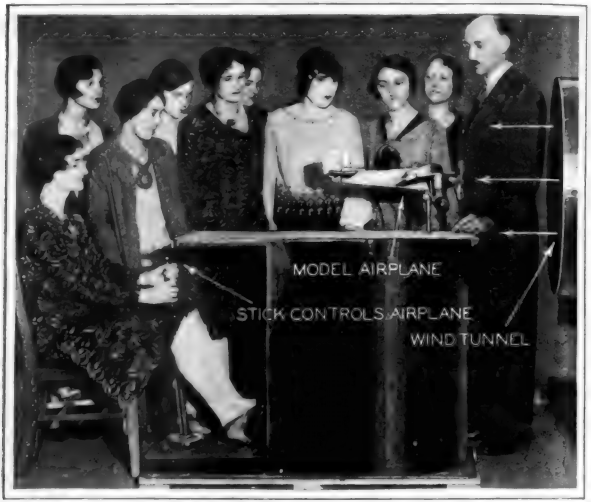
The pilot's theory is that the down-draft off the hill quartered to his ship and directly into the wind curved over and followed the canyon over which he was trapped. It is estimated that the cold air stream forming the settle-draft poured down the side of Mount Baldi at a rate of 3200 feet per minute and took the airplane down with it at that rate. The theory has been advanced that the canyon sides sloped steeply and tended to let the flow of air follow the channel and not build up a cushion of steady air which would have broken the fall and permitted Starbuck to pull up and avoid a crash.



Here is an illustration indicating the settle-draft trap which forced Pilot Starbuck down near Mount Baldi.

Airplane designers and engineers have as yet been unable to provide a ship which is capable of combatting such settle-drafts as even the most powerful climbers are helpless in the big settle-drafts.

Wind Tunnel and Model Airplane in Aviation School



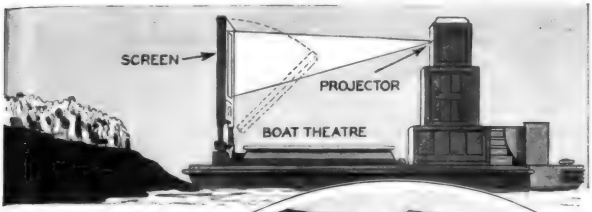
The girl at the stick is controlling the model airplane riding in the wind roaring out of the wind tunnel at the right in order to gain a clear idea of what is required when taking a ship into the air.

A NEW instruction device has been installed for student airplane pilots by Professor Roland Spaulding, aeronautics expert at New York University who is shown above giving members of the first women's aviation school a few pointers on flying. One of the girl pupils sits in the chair "cockpit" and works the controls which in turn manipulate the model Curtiss Robin plane. The plane is in front of a wind tunnel and responds to the air currents just as a full-sized plane would respond up among actual currents of air. The pupil can bank and zoom the model plane without any actual risk to herself. With this device the instructor is able to make many points clear to pupils that would otherwise have to be shown in the air at risk to the pilot and pupil. A mistake in the air often costs life and property but a mistake at the controls of the instruction device can be corrected adequately without danger. Intelligent confidence on the part of the student pilot is also built up with this device.

Airplane Radiator Caps Popular

POPULARITY of the airplane is being felt in automobile accessory circles as evidenced by the increasing number of airplane radiator ornaments and caps. Among the popular models being shown are the hydroplane with electric lights beaming from the cabin windows and propeller that whirls as the car moves.

Outboard Motors Propel Floating Theatre in Holland



An artist's version of the floating movie presenting a program for an audience on the banks of a canal in Holland.

ALMOST every canal bank in Holland, the land of canals and dykes, is a prospective theatre auditorium for the operators of a floating motion picture theatre. An enterprising theatre man conceived the idea of building a boat which would carry the projection apparatus and a ground glass screen, the entire equipment being propelled by outboard motors. The projector and operator are housed in a large steel structure at one end of the barge or boat and the screen is located at the opposite end. Two seahorse motors propel the theatre at a rate of four or five miles an hour.

Photo of the floating motion picture theatre for Holland's canals.

Soap and Towel Kit for Campers

HUNTERS, fishermen and tourists can make good use of this compact paper towel and soap outfit. The soap makes a good, clean lather as the illustration reveals. The outfit is made up in a compact flat package which is calculated to fit snugly into the pocket of any automobile or camping outfit. Campers losing their soap and towel will find this outfit serviceable at all times.

Signs for Universal Speech

USE of the gesture language of the deaf and dumb as a universal means of communication by which citizens of every country could converse with each other without anyone needing to speak any language but his own has been suggested in Austria, following the recent experience of an English visitor in a remote village. Finding himself stranded there without an interpreter, the Englishman, recalling his knowledge of deaf and dumb gestures, made signs that resulted in the village producing a deaf native. The Englishman and native "talked" by signs without difficulty and the native explained his wants to the other natives. It is pointed out that the sign language is already an international language waiting for wider use.

SEADROMES to DOT

The map shows the proposed locations of Langley seadromes, 375 miles apart, across the Atlantic, a series of mid-ocean landing fields which is actually being planned as the result of successful model experiments.

AN experimental model has proved a success, plans are now being made for the anchoring between New York and Bermuda of the first seadrome for ocean flying airplanes and it is the hope of the supporters that as a result such seadromes will eventually dot the oceans providing safe landings for aircraft.

The experimental model of the giant seadromes, which may soon form the mid-ocean landing fields for a trans-Atlantic passenger airline.

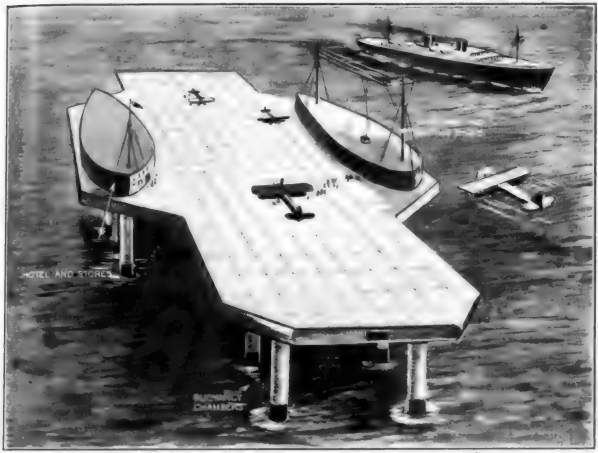
The one-ton steel model of the seadrome was placed in the Choptank River at Cambridge, Md. The model was one-thirty-second the size of the intended dromes. It is essentially a large platform supported by hollow steel columns, each ending in a circular disk. Air in the cylinders supports the platform well above the water and beyond wave action. Speedboats flashed around the model without rocking it and it is expected that the large dromes will not be affected at all by wave action.

The inventor of the seadrome which he calls the "Langley" after the late Samuel P. Langley, designer of one of the first airplanes, was confident of the success of his model. He was formerly a navy engineer and now is consulting engineer for an eastern concern.

After devoting sixteen years to his schemes and experiments for safe sea bases for aircraft he succeeded in interesting the duPont and General Motors financiers in his plans. They have provided Armstrong with three quarters of a million dollars to finance his first seadrome which is now under construction.

This seadrome will have a clear runway 1,200 feet long by 200 feet wide. There will be side rooms or quarters as shown in the illustrations herewith for hotels, hangars and a variety of services. The platform will rise 80 feet above calm sea level. No waves have ever been reported more than 45 feet high so the platform is never expected to

the ATLANTIC OCEAN



An artist's conception of a full-sized seadrome to house hotels, shops, hangars, storehouses and other services. The first full-sized seadrome will be anchored between New York and Bermuda.

be awash. The buoyancy pillars will extend 160 feet below sea level.

The engineer, Armstrong, plans to anchor his first full-size seadrome halfway between New York and Bermuda. He studied hydrographic charts of the region he had in mind and calculated that there must be a high place in the ocean floor and with the aid of a navy survey ship he found the location desired some 400 miles from Manhattan and 375 miles from Bermuda in a virtually straight line. The table on the ocean floor is six miles long and four miles wide. It is only two miles below sea level. The surrounding depth is three to four miles.

The difference in depth will make a considerable saving in securing the 3½ inch steel cable which will be laid to hold the seadrome in place. The huge anchors of the round bobbin type will dig into the sea floor and prevent drifting of the seadrome.

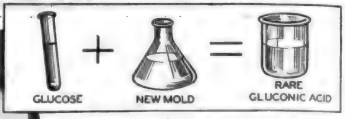
Mr. Armstrong hopes to have the Langley completed and in place by next fall before Bermuda's tourist season begins.

The engineer expects that as the Langley makes financial returns he will construct eight similar seadromes between the thirty-fifth and fortieth parallels and some 375 miles apart between New York and Plymouth, England. The 375-mile distance has been determined upon because it is an easy jump for any airplane and would be sufficient to safeguard trans-oceanic air tourists.

Mr. Armstrong, who is seeing his dream come true estimates that with these seadromes and the servicing made possible by them there will be safe Atlantic air crossings in as fast a time as 20 hours. If his plans materialize as he confidently expects and his experiments would indicate, it is possible that before many years have passed dangers of air travel over the seven seas will have been enormously reduced.

New Mold Produces Rare Gluconic Acid for Medicine

One of the discoverers of the process of feeding glucose to a new mold to cheaply produce valuable gluconic acid is shown at work in his laboratory.



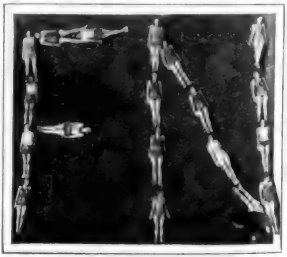
THE startling discovery that despised mold, popularly believed to be a destructive agency only, may be used to develop rare gluconic acid, one of the most valuable acids known to medical science, has just been made by Horace T. Herrick and Orville E. May, research chemists of the U. S. department of agriculture. While looking for fungus growths able to produce tartaric acid they discovered the mold producing gluconic acid by a new method which reduces the cost of the salt of gluconic acid from about $150 a pound to 50 cents a pound. The salt is calcium gluconate and is regarded as the only calcium salt which can be injected between the muscles in the treatment of certain human ailments without causing abscesses. The new mold is fed a certain amount of glucose, kept in liquid of the right temperature and subjected to other processes to produce the rare acid.

Plan Study of Pole Weather

DURING 1932 and 1933, if plans made recently in London are carried out, offices and observatories of the world's weather bureaus will be half-deserted. Many of the weather experts will be camping out in huts or snow igloos or in ships able to withstand crushing by the ice floes somewhere around the borders of the North Pole's ice cap. In 1882 and 1883, by international agreement, expeditions equipped with weather instruments were sent to different points in the Arctic. The result was a considerable increase in knowledge of Arctic weather and of how it affects the weather of other parts of the earth; information since found useful in weather forecasting as well as in elaborating theories of how different kinds of weather are produced. At the recent Conference of Empire Meteorologists in London, representing weather bureaus and similar agencies from all parts of the British Empire, Dr. G. C. Simpson suggested that the fifty-year anniversary of this previous study of Arctic weather be celebrated by repeating it.

Beautiful Figures Make Letters

BEAUTIFUL figures of girls of a motion picture studio are used for making neat advertising letters, nineteen of them being trained to form large letters by reclining on the grass for their sun baths.



Bathing girls form initials in novel advertising stunt for First National pictures.

Private Garage Turn-table Is Convenience for Motorists

THE automobile turn-table has been invented to answer the motorists' prayers. It eliminates the hazard and difficulty of backing a car from a garage down a driveway to the street. The table may be installed within the garage or immediately in front of it, saving yard-room. It is made in two sizes, 14 feet 6 inches in diameter for standard cars and 24 feet six inches in diameter for busses and trucks. There is such perfect balance that heavy cars can be turned by hand with no difficulty or by the touch of an electric button. The platform is made of thick planking laid octagonally with half-inch space for air circulation. It is securely bolted to sixteen radial arms equipped with sixteen stout anti-friction bearings traveling on a circular track set in concrete. The turn-table is particularly useful where space for handling cars is limited as in small yards, alleys and basements.

Above is a car on the turn-table. The driver, by pressing an electric button, can turn the table so that his car heads out of the driveway, thus eliminating backing. The table can also be turned easily by hand.

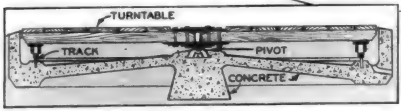


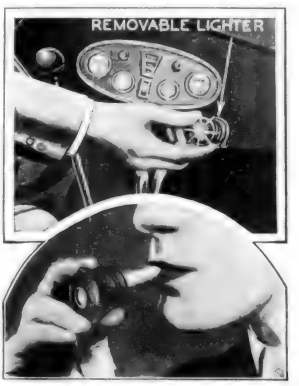
Diagram shows the under structure of the automobile turn-table.

Shining Fly Paper Works at Night

LUMINOUS fly paper that lures light-loving flies to a sticky doom may soon be in use, Lyman Chalkley, Jr., director of research of Pedlar and Ryan, New York, has informed the Illuminating Engineering Society. Phosphorescent pigments mixed with the sticky coating produce a light when the fly paper is in the dark. "Photo-luminescence is finding an increasing number of industrial applications," Mr. Chalkley explained. "Phosphorescent materials, that emit light for some time after the exciting light has ceased, are used on life buoys, sign boards and house numbers." Fluorescent materials which glow only while under the influence of an activating light are also finding use. When illuminated by ultraviolet light, itself invisible to the eyes, they produce visible light used effectively on the stage and in window displays.

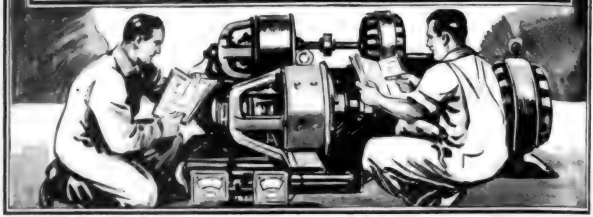
Wireless Cigarette Lighter

A NEW cigar lighter attached to the automobile dash board is pressed until a red glow appears and can then be removed.



This dashboard lighter can be removed for use.

AMATEUR ELECTRICIAN



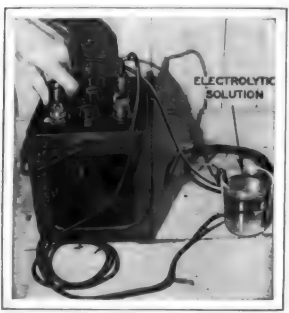
Edited by THEODORE ALLEN

Electricity is one of the most interesting fields open to the amateur experimenter, and the novel uses to which electricity may be put are endless. In this department every month Modern Mechanics presents plans for practical and interesting electric articles which can be built complete in the home workshop at very moderate expense.

Simple Electroplating Outfit Makes Many Useful Articles

ELECTROPLATING, besides being an interesting process with which to experiment, can be put to many uses about the shop or home. The necessary equipment is simple and easily obtained.

You will need a source of direct current. A small storage battery—even a single cell—is satisfactory for ordinary work. A few wires, a glass jar or large tumbler, a piece of the metal you are depositing, and a few chemicals complete the outfit.



This photo shows the simple hook-up of the electroplating bath; the tumbler is filled with a solution of the metal to be deposited electrically.

First try one of the simplest forms of electroplating, that in which copper is deposited. Prepare a plating solution consisting of a quantity of copper sulphate crystals (blue stone) dissolved in water to which a small amount of sulphuric acid has been added. One commercial formula calls for 2 lbs. of copper sulphate, ½ lb. of sulphuric acid and one gallon of water. This solution can be used for most metals other than iron, which requires a special bath. For most work, the amount of acid can be greatly reduced.

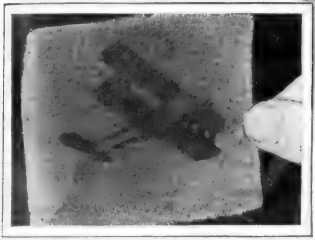
The article to be plated is thoroughly cleaned to remove grease and other impurities. The surface may be polished, if a smooth finish is desired. For removing oil and grease, a hot alkaline solution is best. Some washing soda in hot water will do. An acid solution or pickling bath is used for removing oxides, which are present on the surface of nearly all metal objects.

Suspend the object in the plating solution by a wire attached to the negative side of the battery. Then to the positive pole connect a piece of copper or a coiled-up length of bare copper wire, which is suspended in the plating bath on the side op-

posite the article being plated. Do not let them touch. For copper plating, use a pressure of one to two volts. One cell of a storage battery gives about two volts.

Nickel plating is a little more difficult than copper because so many things can go wrong, but it is nevertheless interesting to try. The bath consists of a saturated solution of nickel ammonium sulphate. Slightly over 12 ounces of the salt in a gallon of water is about right. Use a piece of nickel as the anode or positive terminal. Use a pressure of two to six volts for a few minutes, then reduce to two volts.

The design on the screen is covered with lacquer or shellac, to which the electroplated metal does not adhere. After the electroplating process the lacquer is removed and the design stands forth in the original color of the screen, all ready for mounting.



This screen covering for a radio loudspeaker was made by electroplating method here described.

It is well to confine your first electroplating efforts to copper or nickel.

With an electroplating set-up you can obtain results that are impossible with any other process. For instance, non-conducting objects such as flowers, insects and small animals, lace, and the like can be coated with metal by a simple little trick. First paint the surface with shellac or lacquer, and let dry until it becomes tacky. Then with a soft brush apply a coating of powdered graphite until the surface is a shiny black. Graphite is a form of carbon and is therefore a conductor. Suspend the object from the negative electrode by a wire that makes contact with the graphite coating, and plate as you would a metal object.

Or perhaps you are building a radio cabinet and want some unusual covering for the loudspeaker opening. With a copper-plating outfit you can produce a grill that is out of the ordinary.

Obtain a piece of fine screen made of tinned wire. Bolting screen such as that used in cereal mills is excellent. Cut the piece to the desired size and shape. On a piece of paper of the same dimensions, draw an appropriate design, or you can use an illustration from a book or magazine. Place the wire piece over this design, and fasten with thumb tacks, first placing strips of cardboard around the edges so that the wire will not touch the drawing. Then, with a small brush and shellac or lacquer —black or dark-colored lacquer is the best —trace the design on the screen wire, applying enough to cover the wires thoroughly. Let dry.

The screen is now cleaned with soap and water or other means, and placed in the plating bath. Copper is deposited on it until a fairly heavy coating is obtained, enough to be durable. The copper will adhere to the exposed parts of the wire, but not to the lacquered portion. After plating is complete, wash and dry the screen and remove the shellac or lacquer, using denatured alcohol for the former and lacquer thinner for the latter.

Electric Flasher Dims Lights or Turns Them On and Off

The completed flasher, connected in series with the lamp it operates, is shown in the above photo.

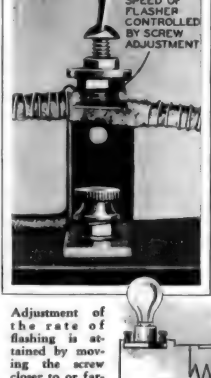
AN ELECTRIC flasher is a useful article to have about the home or store. Its job is to flash, at periodic intervals, lights used in decorating a party table, Christmas tree lamps, window display lights, and so on.

There are several types of flashers, but one depending for its action upon the expansion of a metal strip when heated is the simplest to make.

Necessary materials for a flasher that will operate a 110-volt, 100-watt lamp include a strip of sheet brass or aluminum about 8 in. long and ¾ in. wide; about 20 ft. of No. 30 resistance wire (nichrome); a second strip of sheet brass about 4 in. long and ½ in. wide; a piece of sheet asbestos 7x2 in.; a wood or fiber base about 3x9 in., and miscellaneous bolts, nuts and wire.

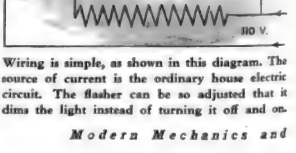
A hole large enough to take one of the bolts is drilled in each end of the 8-in. brass strip. The strip is then bent so that it forms an arch whose center is about 1½ in. high. The arch is centered on the base, and two holes drilled opposite those in the ends. Next, cover the strip with the asbestos so that it forms an insulating layer, and wind on the resistance wire, being careful not to let the turns touch each other or cut through the asbestos to the metal strip. Leave a ¼-in. open space in the center and remove the asbestos at this point so the strip is left bare. One end of the resistance wire is attached to one end of the strip, being held in place by the bolt. The other end is left free for the time being.

Mount the strip on the base. Then drill a hole, large enough to take one of the bolts, near each end of the second brass strip, and bend the piece into a U-shape, with the bends about ½ in. from each end. This will permit the hole in one end to come about ¼ in. above the bare spot of the arch, when the U-piece is placed as shown in the photograph. A bolt holds it in place. The hole in the upper end takes an adjustable contact bolt. This is simply a brass stove bolt held in place by two lock nuts. It will be worth while to equip the bolt and the surface of the strip with contact points taken from an old automobile spark coil, a generator circuit breaker, or similar device.



Adjustment of the rate of flashing is attained by moving the screw closer to or farther away from contact point.

Wiring of the flasher is simple, as indicated by the diagram. One end of the



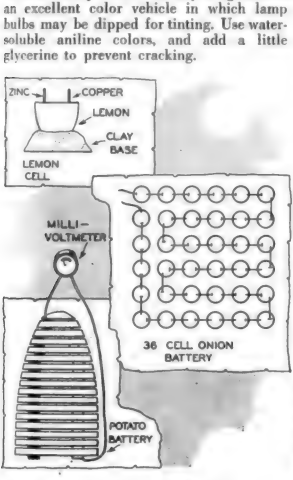
Wiring is simple, as shown in this diagram. The source of current is the ordinary house electric circuit. The flasher can be so adjusted that it dims the light instead of turning it off and on.

resistance is connected to the metal strip and to one lamp terminal. The other end of the resistance goes to the center contact (that supported by the U-piece), and to one of the power line terminals. The other power lead goes directly to the lamp. When the flasher first is connected, the resistance wire will become hot and will in turn heat the metal arch, causing it to expand slightly. This expansion brings the arch against the center contact, shorting out the resistance wire and causing the lamp to burn. Then the arch will cool and contract, breaking the contact and causing the lamp to go out. The process is then repeated. Rate of flashing is controlled by adjusting the center contact screw.

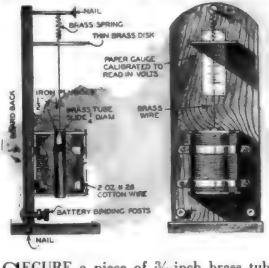
If less wire is used on the resistance, the lamp will not go out completely, but will become dim. This action is sometimes desirable, as where a number of flashers are operating different colored lamps whose light blends together in ever-changing hue. —Walter E. Burton.

Making Tinted Lamp Bulbs

WATER-GLASS (sodium silicate) which can be purchased at any drug store is an excellent color vehicle in which lamp bulbs may be dipped for tinting. Use water-soluble aniline colors, and add a little glycerine to prevent cracking.



How to Make an Ammeter



SECURE a piece of ⅜-inch brass tubing three inches long, and to either end mount cardboard coil ends to hold the No. 22 magnet wire, of which two ounces is to be wound around the cardboard. Three layers of wrapping paper are first placed between the brass tube and the cardboard ends and shellacked in place. Make a bracket as shown in the drawing and drive a nail from which to suspend a fine brass spring, at the end of which is a thin brass plate to give the readings. An iron solenoid ⅜ by ⅜ inches is soldered to the end of the brass wire so that it hangs in the mouth of the armature core. Make the reading scale from paper. By connecting the voltmeter to a battery, and taking the battery reading with another meter, the scale can be calibrated.

Electricity from Vegetables

DID YOU know that you can get electricity from vegetables? Cut a lemon in two and pack some damp clay around the base so it will stand upright. Stick a strip of zinc and one of copper in opposite sides of the lemon, as shown at left. Connect the protruding strips with copper wire to a millivoltmeter, which registers delicate currents, and you will find a slight current indicated. You can make a battery by cutting a potato in thin slices and piling them up with a strip of copper and zinc between each layer. Another interesting battery can be made from the halves of 36 onions, connected as shown with a copper wire run down in one side of the onion half and then across to the top of the zinc strip run down in the other side of the onion half.—Dale Van Horn.

How Liquor 'Importers' Make 'Old Stuff' from Alcohol

Product of a "reliable importer" seized in his hotel room, a plant for making "old stuff" from denatured alcohol.

A dry officer shows how denatured alcohol is cut with water and doctored with creosote and burnt sugar, and below, wrapped with straw.

The labeler of original "King George's Scotch" could not do a better job than the dry officer at work above with captured equipment of bootleggers who fool the public. Carefully checked statistics of federal and state officers reveal that less than one per cent of the "bottled in bond" and "imported" liquor reaching the American consumer is honest in origin. The other 99 per cent is counterfeit, poison of varying degree, the officers declare. The bootleg stuff is made in cheap hotel rooms, cellars, barns, and even pig pens.

Bedroom on Stilts 10 Degrees Cooler Than on the Ground

WHEN A. Winters, a Californian, needed a cooler sleeping place he built a bedroom on top of a forty-foot steel tower, up in the air where the breezes are blowing. The room is large enough for a bed, two chairs and a small table. It is reached by means of a small electric elevator through a trap door in the floor, a convenience suitable for many a two and three-story house. Records show that the temperature at the height of the sleeping room averages ten degrees cooler than on the ground and it is particularly suited for low regions where vapors and fogs lie close to the earth. The chamber makes an ideal place for reading or studying.

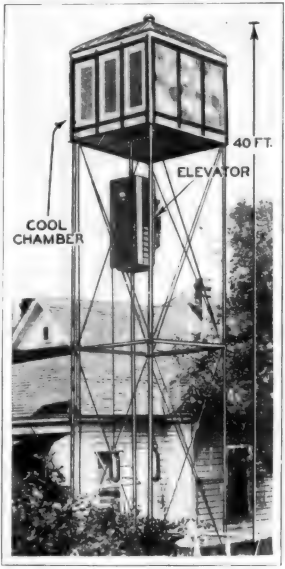


Photo shows cool sleeping room 40 feet above ground which is reached by electric elevator.

Electric Device Heats Cheaply

A NEW method of heating homes or offices by electricity, using metal radiators which are never more than comfortably warm but which are very efficient in use of electric current, is being introduced in England by the City of London Electric Lighting Company. Ordinary electric heaters, the wires of which are hot enough to shine, use more than twice as much electricity for the same heating effect, the Company's engineers have found, as do the new "dark radiators" which emit pure heat without wasting energy in light. The electricity passes through metal sheets and warms these to a temperature somewhat below that of boiling water. Air in contact with this metal is thus warmed and rises, just as it does when in contact with a radiator heated by hot-water or steam. This warmed air is replaced by colder air from the lower part of the room, so that a gentle circulation of both air and heat is maintained. An ordinary office room can be kept warm 24 hours a day at a cost of less than fifteen cents. Other rooms can be heated proportionately.

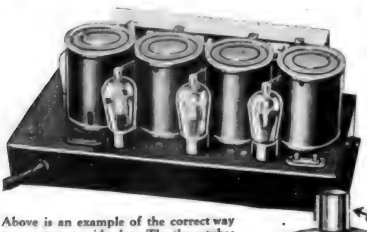
Toy Air Limousine Has One Hundred Fifty Rubber Band Prop Power

Above is a toy airplane which will fly several hundred feet.

A TOY produced by a western manufacturer is guaranteed to fly several hundred feet. It is equipped with 150 rubber band propeller power, and has a steering wheel, gauges, levers, in fact about everything that is found on a regular machine. The windows are of celluloid and the passenger department is luxuriously upholstered.

What's What in RADIO

What is the screen grid tube? What does it do? What are the advantages of the condenser speaker? These are a few of the questions that occur to folk trying to keep abreast of developments. Mr. Miller, who attended the Chicago radio shows, here gives the answers.



Above is an example of the correct way to use screen grid tubes. The three tubes in the foreground are screen grid; four other tubes are shielded in metal cans.

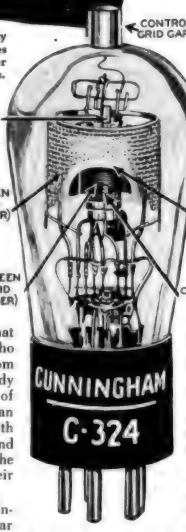
I WENT to a furniture show the other day and saw some clever new adaptations of radio to home decorating.

And then I went to a radio show and saw the finest furniture exhibit in Chicago.

That, in brief, is the status of the radio business in this winter season of 1929-1930. Radio has gone Grand Rapids with a vengeance. There's no comfort in that for the dyed-in-the-wool fan who helped raise this radio business from its crystal detector days, but the lady who wants a decorative piece of furniture for the home, and the man who wants the chain programs, with the best possible reproduction, and beyond that doesn't care how the thing works, are at last getting their innings.

In the technical field the most interesting developments of the year have been the screen grid tube and the condenser speaker, the latter having its first public showing at the shows.

The truth about the screen grid tube lies somewhere between the statement of one show salesman that the manufacturers took it up to give them something new to talk about, and the equally emphatic declaration of another salesman that it is the greatest discovery since Dr. Lee De Forest pumped the air out of the first three-element radio valve. Both salesmen, by the way, represented tube manufacturers. The truth seems to be that the screen grid tube is an excellent improvement when properly used, and not so good unless a set has been specifically redesigned to take advantage of its characteristics. The tube, for the benefit of those who have not seen one, consists of four elements instead of three. There is the familiar cathode, or filament in the center, the usual grid to act as a valve in intercepting the streams of filament electrons, and the plate, which the electrons bombard, but outside of the plate is a fourth element, the screen grid, looking something like a tube formed of fine netting. Screen grid tubes are not exactly new, for Europe has had them for four or five years, but the usual European design placed the screening grid between



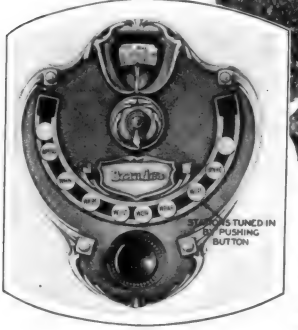
A closeup of a typical screen-grid tube, cut away to show the various units which compose it.

TODAY

By JAY EARLE MILLER

the old grid and the plate, instead of outside the latter.

In theory the screen grid tube, as used in the radio frequency stages, develops a possible amplification of forty times the input, as compared to an average amplification of eight in the old 201-A of more or less blessed memory. That means that with 201-A's the first tube in the r. f. stage amplified the signal eight times, or 64 times the original input, and so on.



Simplification of tuning has been achieved by most manufacturers in the newer sets. In the method shown at the left, favorite stations are tuned in by simply pressing a button.

In actual practice a couple of manufacturers, through careful design, are getting amplification of thirty-five times out of the new screen grids, which is close enough to the theoretical perfect to make the tube well worth while. Careful design, in those cases, includes shielding the tube, shielding the coils separately, and also shielding the condensers.

The condenser speaker invented by Colin B. Kyle, a California school teacher, was the one new thing in reproducers this year, and, though fifteen manufacturers of sets have been licensed to use it next year, it so far appears only in sets made by a subsidiary of the company that financed Kyle's invention. The condenser speaker, however, got a good boost at the Chicago show when all of the exhibition rooms were completely equipped with a broadcast system employing them, with excellent results.

The chief advantage of the speaker is that it lends itself to such varied use, though this is backed by excellent reproduction, as good as any dynamic, magnetic or cone type in general use, and better than many of them. The speaker is made in standard sections, about 8 by 12 inches in size, and any number of these sections can be combined to build a speaker of any size or shape. The sections are hardly an inch thick, and a half dozen of them assembled behind a framed tapestry can hang on the wall like a picture.

Unlike all previous speakers it has no moving parts, in the accepted sense, and no

A radio without dials, shown at right, is operated by remote control. The control box can be placed in any room in the house, as shown above, being connected by cable with a motor driven selector built into the radio cabinet.

magnets or coils. A plate of aluminum is punched full of little slots, about ⅛ by 1 inch, coated with a thin non-conductor, and over that is glued a sheet of foil. The metal plate is given a negative bias of some 400 volts, and one side of the radio output is attached to the plate and the other to the foil.

One interesting thing about the show was the number of makers who are getting away from revolving dials and producing a straight line tuning device, with a knob moving from side to side. An interesting improvement, shown on two makers' sets, was a semi-automatic tuner, in which the favorite stations are marked on a horizontal strip of cardboard, the knob is shifted until a pointer points to the one desired, and the knob is then pulled outward, when the connecting mechanism revolves the condensers to the exact point needed to tune in that station.

Another interesting tuning device has come out of Thomas A. Edison's laboratory, a red light behind a transparent revolving strip, which lights only when the station is exactly tuned. A station is tuned to maximum volume, and its call letters then written on the transparent

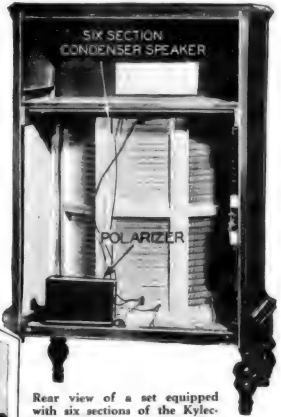
Dialless radio, controlled remotely by automatic tuning buttons.

strip. Next a screw driver or the edge of a dime is inserted in a screw head beside the tuning dial, the screw given a half turn, and a cam arrangement operates a punch which marks an impression in a thin copper disc, revolving beside a contact point. Next time you want that station the warning light will come on when the impression of the disc touches the contact point.

Comparing this year's New York and Chicago exhibitions with the shows of three years ago some of the notable changes were:

Condenser Speaker Has No Moving Parts; Can Be Assembled in Sections

A new development is the condenser speaker, with which the set at the left is equipped. It is built in rectangular units 8 by 12 inches in size, which can be mounted behind pictures or otherwise concealed.



Rear view of a set equipped with six sections of the Kylectron condenser speaker. The polarizer places a high potential of approximately 450 volts on the plates of the condenser speaker.

Colin Kyle, inventor of the condenser speaker, is shown above holding one of the sections of his invention. The large disk represents an early attempt at a condenser speaker, being Kyle's first model to be produced.

Bakelite panels have absolutely disappeared, in favor of wood in practically all of the console models and wood or metal in the other sets.

There was not a single kit or parts maker displaying at the Chicago show, with the exception of one manufacturer of short wave transmitters and receivers. Not a single storage battery was on exhibition—everybody having gone "all-electric." The only dry cell exhibit was confined to small flashlight and electric lantern batteries. A number of cabinet makers exhibited, but confined their attention to the trade, and none offered cabinets for home built sets.

The all-electric extent of the shows this year is surprising, for apparently nothing is being offered for the family that hasn't had its house wired, or lives beyond the reach of the electric lighting lines. Of course, there are still large stocks of battery sets on the markets, unloaded at sacrifice prices, but none of them get into the shows. A typical newspaper advertisement during the Chicago show offered $285 seven-tube console models at $49.50.

SPARKS from the RADIO EDITOR

Edited by L. B. ROBBINS

Mr. Robbins is nationally known as an authority on radio short cuts and kinks which help the radio fan to save money and perform interesting experiments. Mr. Robbins has operated amateur station W1AFQ for several years.

Repairing AF Transformer Primaries with High Voltages

AN OPEN transformer primary or even a secondary is often caused by the expansion of the coil, which eventually causes an open circuit. In this case a transformer is generally thrown away and a new one substituted. By the following trick many such transformers can be salvaged and made as good as new.

Testing repair with dry cell and head phones.

The break can be healed by the application of a much higher voltage than that under which the transformer is generally operated. With an AC set this is easily possible because the high voltage from the power pack can be utilized. For instance, if it is the primary of the first audio then an excess of about 45 volts is necessary. About three times the usual voltage is used for the healing process. In other words, from 135 to 150 volts will be the thing. Lead the primary terminals direct to the high voltage of the power pack. Apply this for a few seconds and then test. If still open, apply for a longer period and test until the circuit is closed. Up to 500 volts can be applied to primaries for up to an hour. On secondaries give only a few seconds.

Testing can be done by inserting a dry cell and headphones in series with the winding and listening for the click, as illustrated in the photograph at the left. This indicates a healed circuit, and you have saved yourself the expense of purchasing a new transformer.

Talking Portrait Is a Mysterious Radio Stunt for Party

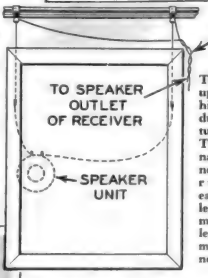
THE next time the radio fan throws a party he can mystify and amuse the crowd by demonstrating this "talking portrait." For it you will need a framed canvas or portrait, easel, cone type speaker unit, receiving set, etc.

Place two flat metal plates under the rug or carpet where the picture is to be shown and as far apart as the distance between the easel legs. Wire these under the carpet to the loud speaker outlet of the receiver. Next, wire the phonograph pickup jack of the receiver to a microphone in series with six volts of dry cell. Conceal all the wiring and have the "mike" in a distant point, but where your accomplice can see what is going on. If there is no pickup jack connect the two mike wires to the primary terminals of the first audio transformer.

Now fasten the speaker unit to the back of the picture frame and run the wires carefully back of the picture and down the back of the two easel legs to nails driven in the bottom of the legs that project out about half an inch. That is all there is to it.

When ready move the easel out and set it in position so the nails pierce the carpet and make contact with the metal plates.

This completes the speaker circuit and the accomplice in the basement, closet or outside the window can then talk into the mike.



The method of wiring up a speaker unit behind a portrait to produce a "talking picture" is shown above. The portrait rests on nails which are connected to metal rods running down the easel legs, unless the legs themselves are metal. Pegs in the legs make contact with metal plates underneath the rug.

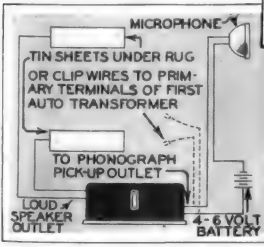


Diagram shows the connections to be made in hooking up the talking portrait stunt. Tin sheets under the rug make contact with the easel.

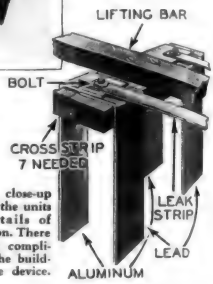
Clean Sets Give Better Tone

EVEN though your radio is enclosed in a cabinet, the parts are not free from dust, which causes considerable noise and loss of volume and distance. A fairly stiff small brush of the sort used in cleaning typewriters, dipped in alcohol and rubbed briskly over all connections, will remove the accumulated dust and corrosion. Do not get alcohol on the coils. A pipe cleaner drawn between the condenser plates will clean them perfectly. If the coil winding has become loosened, a drop of collodion will fasten it.—Harold Beebe.

Making a Wet Electrolytic Rectifier for High Voltages

This home-made device provides an inexpensive means of rectifying AC current.

The above photo shows the working units of the electrolytic rectifier ready for inserting into the mayonnaise jars containing the solution. Note the convenient handle for lifting.

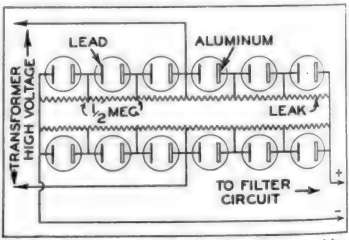


Here is a close-up of one of the units giving details of construction. There is nothing complicated in the building of the device.

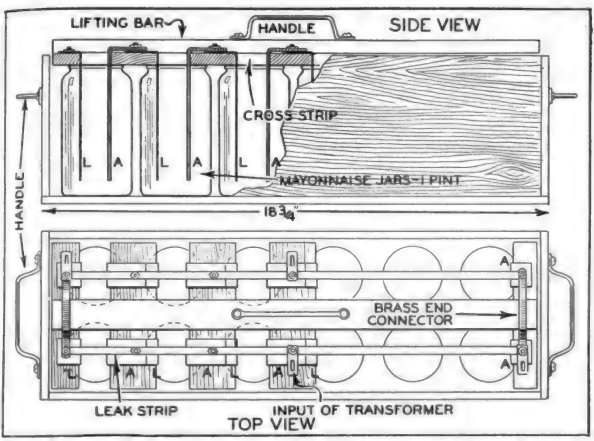
THE most inexpensive method of rectifying AC current is by means of the electrolytic or "wet" rectifier. But the amateur usually encounters difficulty in constructing such a rectifier that will not heat or spark unless it is built large and cumbersome. The one shown in the photos and sketches overcomes this trouble and will easily handle a thousand volts or more and run cool hour in and hour out. The exact dimensions and constructive layout are clearly shown.

The case can be made of any ½-inch soft wood 18 in. long, 5½ in. high, and 6¼ in. wide, outside measurements. This will take 12 pint size mayonnaise jars in two rows of 6 each. Then cut out 7 strips of wood 1 in. wide by ½ in. thick and long enough to fit inside the width of the case. Arrange them parallel equidistantly apart and fasten a lifting bar of wood over them at right angles to them and down their middle. Then boil the assembly in paraffin.

Cut 12 strips of stiff, pure aluminum and 12 strips of lead 5 in. by 1 in. wide. Bend over an inch of each at right angles. Bolt a pair of each to the ends of each cross piece except the end pieces, to which only a single piece should be fastened. Arrange them exactly as shown in the diagrams, one overlapping the other under the bolts. Then cut two strips of heavy drawing paper and soak it in India ink, letting it dry. Punch holes where necessary and place a strip on each side lengthways, clamping down under the bolt heads. Each section between cross pieces is about 2 in. long and with the paper cut ⅜ in. wide will give a resistance of between ½ and 1 megohm. This leak is the secret of a cool running rectifier and its ability to stand a high load per cell. Attach handles to the case ends and to the lifting bar. The assembled elements will then sit in the jars in pairs and make a snug fit. Four Fahnstock clips arranged as shown act as input and output terminals. Being a bridged rectifier, the input is in the exact center and the output at each end: lead negative and aluminum positive. Brass



Schematic diagram of the rectifier showing wiring.



Method of mounting the dozen pint mayonnaise jars inside a wooden case is shown in these diagrams, which show cross sections of the completed rectifier ready for use.

straps connect the two like elements at each end cross piece.

The best rectifier solution known is as follows:

Citric Acid	368 grams
Ammonium Citrate	425 grams
Ammonium Phosphate	150 grams
Potassium Citrate	8 grams
Distilled Water	1000 c.c.

Dissolve under gentle heat until syrupy and colorless. This has a working voltage of 160 volts per cell, breakdown voltage of 210, critical temperature of 120 F. and a life of 69 ampere hours per 100 c.c. of solution. A saturated solution of 20 Mule Team Borax can be used if desired and works well, but its working voltage is less and life shorter, although it has the advantage of being cheap. In any case fill the jars to within an inch of the top and cover with a thin layer of Nujol or other mineral oil to prevent creeping and evaporation.

Form the plates by applying the 110 AC current direct to each cell for about 5 minutes until the aluminum plates turn gray. Then, after all cells are formed, connect the transformer output to the two center clips on the rectifier. The rectified current is taken out of two end terminals—plus and minus as marked. For pure DC it will, of course, have to be then filtered.

While this rectifier, with its 160 volts working voltage per cell, will handle much more than 1000 volts it will be well not to overload it. If higher voltages are to be handled simply increase the number of jars, using an even number, until the number will be well within the margin of the entire working voltage of the assembly.

Insulating Wire With Shellac

THE experimenter is often faced with the problem of getting a piece of copper wire with a thin insulation. If enameled wire cannot be procured a length of bare wire can be quite well insulated by coating it with shellac. Provide a pan of shellac on the bench and wind the wire on a spool at one end of the bench. Then grasp the wire in one hand and draw it off the spool through the shellac, wiping off the excess with a cloth held in the other hand. Two or three such applications with a drying between each, will give you a well insulated wire for use where too great currents will not be passed. Stretch the wire in a dry room until hardened.

Gear Shift Guide Aids in Teaching Beginners to Drive

Gear shift guide with slot labels is shown above.

A GEAR shift guide that is especially useful for beginners learning to drive automobiles and for drivers accustomed to the Model T Ford has been placed on the market. The guide is about ten inches high with slots for the gear shift, each slot being labeled. It is said that the guide, showing just where the shift should be made eliminates fear of getting into the wrong gears and begets confidence. The guide is easily installed by removing the ball grip, placing guide down over the shifting lever, placing the lever in reverse and screwing the guide to the floor before testing gear locations and replacing the ball grip.

Ice Wells Built on Farms

"ICE WELLS" as cheap refrigerators, to carry over a little of the free, abundant cold of winter to times when it is badly needed in the summer, are under test by the U. S. Department of Agriculture at its experimental farm at Mandan, N. D. For years geologists have known of many "ice caves" in various parts of the world, in which the water which runs into the cave in winter freezes to ice and lasts well into the summer if not the year round. In Canada, some years ago, farmers began to copy these natural ice caves in making their ice wells. A pit or well is dug in the ground and provided with a cover. During the cold weather a little water is run each day into this pit. This daily "dose" of water promptly freezes, gradually accumulating in the pit a large solid cake of ice. When the freezing weather is over in the spring this block of ice in the pit is tightly covered, like a refrigerator; doors being provided so that milk, vegetables or other perishable foods can be put in and taken out. Such "ice wells" last through the summer. These wells, requiring very little labor, are found very useful as ice house substitutes.

New Angle Tee for Golfers

A NEW tee has been produced for golfers which is said to eliminate a number of difficulties. The tee, pictured below, is placed in the ground at an angle. It is contended that use of the angle tee is conducive to longer drives as it offers no resistance to the ball leaving the tee. When the club head approaches the ball it strikes the angle leaving the ball suspended in midair for a clean getaway. There is nothing for the club to catch on and consequently the tee is not knocked away by the stroke of the club. The angle tee is made of colorfast fibre and it is claimed that it speeds up the game by eliminating time lost looking for tees.

This shows the position of tee, ball and club.

Salesman Hoists Auto Nine Stories to Reach Prospect

WHEN Edward Horton, stage and talkie star, would not grant an interview to Ralph Johnson, Los Angeles automobile salesman, who wanted to sell Horton a car, the salesman tried various means of reaching the star. He was persistently put off and couldn't even get Horton to look at his car. Being reared in the Go-Getter School for Salesmen, Johnson solved his problem. He had his car hoisted to the ninth floor window of Horton's hotel and there he put over a sales talk that, coupled with the appearance of the car, sold the actor the job.

Ralph Johnson makes his sales talk high in air.

Quiet Buildings Are Planned

SCIENTISTS at the Bureau of Standards have begun an intensive study of noise as it exists in the city home, apartment house or office.

In order to have accurate data on the penetration of noise and unwelcome sounds through the walls of the modern home or hotel these federal scientists found it necessary to construct a synthetic noise machine —a device that would make various noises of a quality and kind that usually annoy. These sounds were then measured.

By using electric current and quartz crystal it has been possible to produce a wide variety of sounds for the purpose of the tests. Dr. V. L. Crisler has made this device and in cooperation with builders hopes to be able to give help to those who wish sound-proof houses.

The vibration of the crystal on the walls and building materials is being measured and figures gathered. It may easily be possible within a short time for the individual who wants quiet to order the building materials that have been marked as to their sounding qualities.

Waterlily Holds Growth Record

A GIANT-LEAVED waterlily of Japan and China probably holds the world's record for speed in leaf-growing. This plant, a relative of the Victoria regia of South America, expands its four-foot floating leaves in less than nine days.

Model of Airship that Successfully Reaches Mars — in the Movies

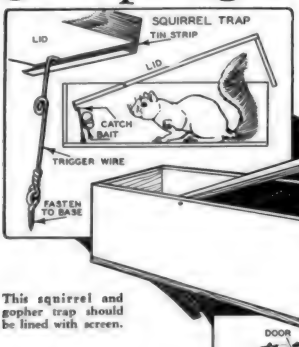
Anton Groat, technician, shows the ship to Alexander Gray.

HERE is a motion picture corporation version of the airship that will reach Mars. The model for the "prop" ship was made under the directions of Anton Groat, head technician for the corporation which is to produce "No, No Nanette" which calls for a voyage to the planet Mars.

Simple Small TRAPS

By HI SIBLEY

These old time favorites among trappers are simple and humane. They will trap pets for your menagerie. Simple materials, a little time, a little patience, and you can have a good string of traps of your own!



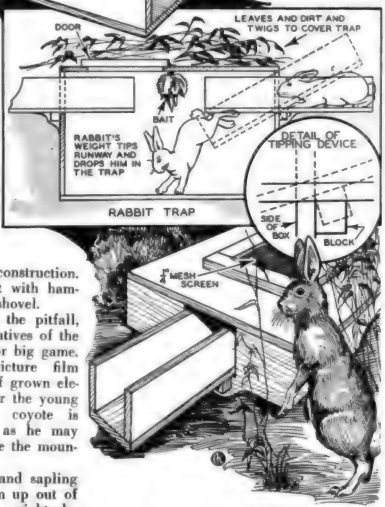
This squirrel and gopher trap should be lined with screen.

THERE is a lot of good sport in trapping small animals, especially when you make your own traps. Besides, one never knows just what sort of varmint he's going to catch and that adds a thrill or two.

With one exception these traps all take their quarry alive and uninjured, and they may be kept for the home menagerie. The diagrams illustrate their simplicity of construction. Any one of them can be built with hammer, saw and jackknife, or a shovel.

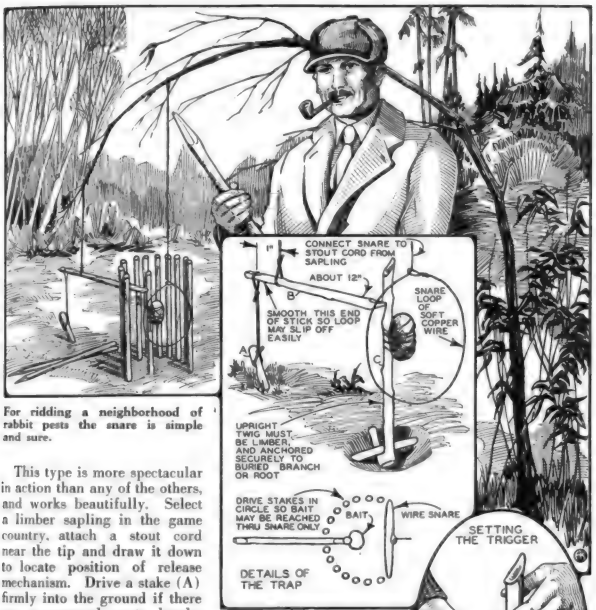
Probably the oldest type is the pitfall, which is used to this day by natives of the African and Siamese jungles for big game. In fact, a recent motion picture film recorded the trapping of a half grown elephant in this type of trap. For the young American, however, a fox or coyote is probably as large an animal as he may expect, unless he wants to tackle the mountain lions in the coast ranges.

The advantage of the snare and sapling trap is that it swings the victim up out of the way of other animals who might devour it and also prevents its gnawing its way to freedom.



With a screen door top, this variation of the pit trap is infallible for rabbits and gophers.

will Catch Winter Game



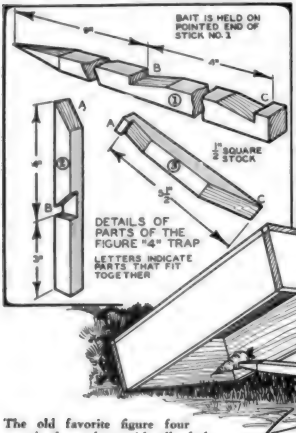
For ridding a neighborhood of rabbit pests the snare is simple and sure.

This type is more spectacular in action than any of the others, and works beautifully. Select a limber sapling in the game country, attach a stout cord near the tip and draw it down to locate position of release mechanism. Drive a stake (A) firmly into the ground if there are no exposed roots handy, and about 12 inches from it, toward the tree, anchor a limber green twig with a notch near the upper end (C) as shown in the diagram. Now cut a cross stick (B), about 12 inches long, sharpen one end to engage in the notch of (C) and smooth the other end so that the cord loop will slip off when the trap is sprung. From the sapling suspend a soft copper-wire snare-noose so that it hangs four or five inches from the upright stick (C) which holds the bait. To prevent the loop from swinging about, put in light stakes against the bottom in such a manner that they will not interfere with its action when the catch is released. A semi-circular row of stakes around the bait makes it impossible to reach it except through the snare-loop. The

This shows how the stakes are driven and how the trigger to spring the snare is made.

This is the manner in which the snare trigger is built to spring quickly.

Here's the "Figure Four" Trap



The old favorite figure four trap is shown here with all of the elements that go to make it successful. To the right is the wire trap.

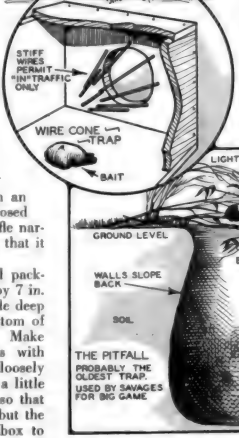
bait should be tied to the stock (C). It is well to wear gloves.

The "squirrel" trap is suitable for rabbits and gophers as well as squirrels and chipmunks. Make a box 15 inches long and 6 inches square, with one end and the top left open. The top, with the end attached, is swung on an axis about six inches from the closed end. This assembly should be a trifle narrower than the inside of the box so that it will operate freely.

The rabbit trap: In a good-sized packing box cut holes about 6 in. wide by 7 in. high opposite each other. Dig a hole deep enough to set the box with the bottom of the openings flush with the ground. Make two wooden tunnels or gangways with open tops about 18 in. long to fit loosely in the box openings. These are set a little more than halfway out of the box so that the outer ends rest on the ground, but the weight of the rabbit entering the box to get the bait will tilt the outer end up and slide the captive into the box. Small blocks are nailed to the underside of the tunnels to prevent them sliding into the box with the rabbit.

For small rodents the wire cone trap is a baffling device. They squeeze into it freely in quest of the bait, but every time they try to get out, the wires close on them. Bore a hole in the end of a wooden box. Around the edge of this hole insert a series of short wires that are stiff but with plenty of spring. Bend them toward an apex at the inner ends, just so they are about half as far apart as the diameter of the hole. The wires offer very little resistance to the quarry until it attempts to get out.

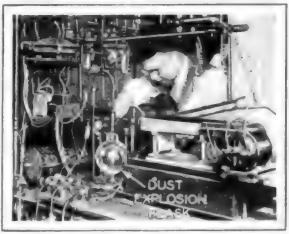
The "Figure 4" trap is an old and tried device, but nevertheless a very efficient one. It is very good for birds, but burrowing and gnawing animals can make their way out without much trouble, unless the box is well weighted and the trapper arrives soon after the catch. This can be made with only a jackknife from sticks about ½ inch square. Larger or smaller will do as well. Details of trap are shown at left above.



And here's the oldest trap known to man—the pit in the ground under debris and brush.

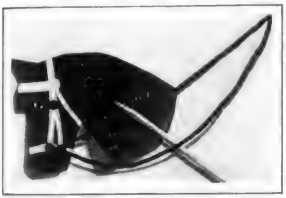
Smooth Soap Powder Is Found To Be Highly Explosive

SOAP dust in suspension is violently explosive. It is a well known fact that many dusts are highly explosive. Accumulations of dry coal dust are capable of blowing up a coal mine; rubber dust, aluminum dust and other industrial dusts are explosive but it comes as a surprise that soap dust when suspended in air is highly explosive, capable under certain conditions of causing explosions that might destroy life and property. This discovery has been made at the Pittsburgh experiment station of the U. S. bureau of mines. The hazard arises only in case of suspension of considerable amounts of the dust in air as might occur in process of manufacture. Ordinary household use of soap, however, carries no hazard whatever.



Dust explosion flask, fitted with automatic tuning device and pressure recorder, which is used by the bureau of mines in research on dust blasts.

Toy Horse Is Easy to Make



A HORSE all ready for the children can be made from a pasteboard box, and cleverly colored. The picture above will serve as a pattern. White paper gives the outlines of the harness, worsted yarn makes the reins and a lolly-pop stick is the body.

Insect Pulls 530 Times Its Weight

A SAMSON among insects, able to pull a toy railway car 530 times its own weight or to drag a load of pins 27 times its weight, is disclosed in the common earwig by photographs made by the British entomologist, J. J. Ward, and published in his contribution to the natural history series, "The Wonders of Animal Life," now being issued in England. An average man proportionately as strong as an earwig would be able to pull along the street two railway freight cars weighing nearly twenty tons apiece or to drag across a plowed field a dozen or so saw logs with a total weight of 4000 pounds. Earwigs are small, dark brown insects, often found in holes in fruit hanging on a tree or between the petals of flowers. The rear end of the earwig's body is armed with a pair of gigantic pincers, although no one has ever seen them pinch.

Netherlands Army Corps Hauls Big Guns with Six-wheel Caterpillar

First test of caterpillar truck in Europe is reported successful

THE latest addition to the Netherlands' army motor division is the new six-wheel truck with a caterpillar band, which was recently tested in the dunes with great success. This is the first truck of its kind to be used in Europe, and its powerful engine is capable of drawing huge guns up and down steep inclines and over rough surfaces thus making for rapid transport.

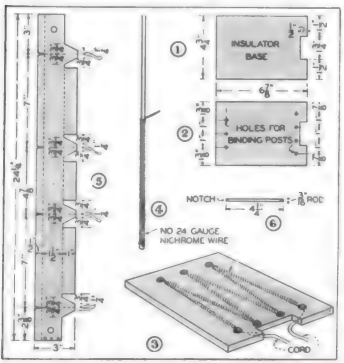
HOME WORKSHOP

Edited by A. NEELY HALL

Mr. Hall, editor of the Home Workshop department, is especially well known to young craftsmen as author of such familiar handicraft books as the "Big Book of Boys' Hobbies," "The Boy Craftsman," etc. This month his plans include an electric grill for the kitchen, and a bobsled for outdoor winter sport.

Easily Made Electric Grill Is Handy Article for Home

A GRILL is one of the simplest pieces of electrical apparatus to make, and the photograph on page 153 shows a practical model for which the following materials are required: 1 piece of insulator board ⅝ inch thick, 5 inches wide and 7 inches long for the base of the heating element, 12 feet of No. 24-gauge bare nichrome resistance wire for the heating element, 7 3/16-inch stove bolts ¾-inch long for binding posts, washers, a strip of galvanized iron 3 inches wide and 24¼ inches long, for the grill frame, copper rivets, three pieces of 3/16-inch steel rod 4¼ inches long, 2 porcelain tube insulators, 9 feet of drop cord and an attachment plug. If your local dealer in electrical supplies hasn't the nichrome wire, he can get it for you.



This drawing gives the dimensions of parts for the electric grill, and shows the method of shaping the wire.

First, lay out the piece of insulator board of the exact size shown in Fig. 1, with one end notched. Cut it out, and locate and drill holes for binding posts where shown in Fig. 2.

Shape the resistance coil out of the nichrome wire. Wind the wire around a 3/16-inch or ¼-inch dowel-stick, with turns placed close together, as shown in Fig. 4, then slip off the coil, pull out the turns so that they are separated about as shown in Fig. 3, and mount upon the insulator board, extending the coil from binding-post to binding post, as shown in Fig. 3. Connect

the ends of the drop cord to the two terminals of the coil, and the wiring will be complete.

Lay out the iron frame in one piece, by the pattern of Fig. 5, cut it out with a pair of tinsnips, and fold where indicated by the dotted lines. You will see by the photograph how the upper edge is folded over to form a rim. In the same way, the lower edge is folded over to form a support for the insulator base of the heating element. Bend the strip over a sharp edge, and make the bends square and uniform. Drill overlapping ends and rivet them. Drill two holes for the drop cord and insulators, in one end of the frame.

Slot the ends of the three steel rods, as shown in Fig. 6, slip them over the edges of the upper rim of the frame, space them at equal distances apart, and hammer the notched ends to make them grip the rim so that they will not slip out of position.

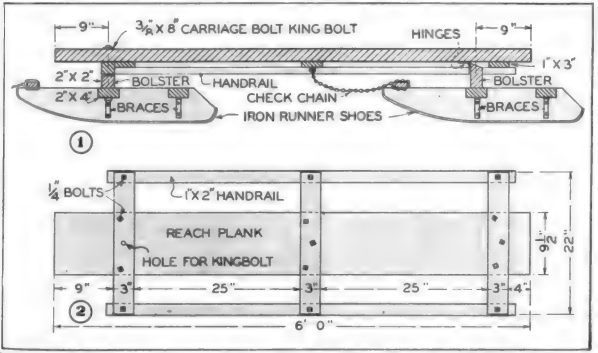
Here is the completed home-made grill, ready to do the work of an expensive manufactured one.

When you have assembled the frame, finish it with a coat of radiator aluminum paint, then slip the insulator base of the heating element into the frame, and bolt it to the lower rim. Wedge the insulators into the terminal holes in the frame, and connect the dropcord to the coil terminal binding posts. The grill is now ready to be plugged into the socket and put into service.

With This Sled You Can Enjoy Thrilling Winter Sports

YEARS ago the bobsled was of little use to the city boy who had no coasting hill within his vicinity, but the automobile has changed the situation, making hills available to almost every one. Consequently, the bobsled enjoys a one-hundred point rise in popularity, and a demand has been created for plans for home-made bobs. Because of requests recently received from readers, I am presenting plans this month.

The photograph shows a bobsled with a 6-foot reach, which seats three coasters comfortably, and will accommodate four. This is an easy rig to build, and if you are



Dimensions of the frame and runners of a sturdy, handsome bobsled are given in the above drawing.

Bobsled Carries Three Passengers Easily, or Four With a Little Crowding

All set for the down-grade! A fourth passenger can be accommodated without taxing its capacity.

acquainted with the prices of similar factory-built bobs, you will be surprised how little the materials will cost for this home-made model. The bob requires one piece of 2-by-10 6 feet long for the reach plank, one piece of 1-by-2 14 feet long for hand rails and footbars, one piece of 1-by-3 6 feet long for handrail supports, one piece of 1-by-6 10 feet long for sled runners, one piece of 2-by-4 8 feet long for runner cross plates and rear bolster, one piece of 2-by-2 4 feet long for front bolsters, one ⅜-inch carriage bolt 8 inches long for a king-bolt, eight 3-by-3 iron braces for the sled runners, and screws for attaching them, ¼-inch stove bolts for assembling parts, and four ¾-inch half-oval iron runner shoes 32 inches long with screws for attaching them.

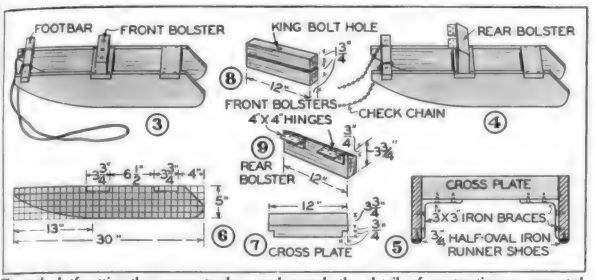
First, build the sleds (Figs. 3 and 4). They are identical in shape and size. Figure 5 shows a cross-section, Fig. 6 a pattern for the runners, and Fig. 7 a detail of the cross plates. The runner pattern has been ruled off into squares to assist you in reproducing the curves. Make a similar set of squares upon a sheet of heavy wrapping paper, ruling vertical and horizontal lines with a spacing of 1 inch, to form squares. Then locate the curves upon the 1-inch squares just as they are shown upon the diagram square.

Saw out the runners close to the outlines, then true up the edges with a plane, and smooth them with sandpaper. A wood rasp will be helpful in finishing the curved edges. Notch the top edge of each runner, as shown, to receive the ends of the cross plates. Cut the ends of the notches with a saw, and split out the wood between with a chisel.

Lay out the ends of the cross plates as shown in Fig. 7, to fit the notches in the runners. The shoulders thus formed will make stronger joints than would be obtained by letting the square ends into the runners. With the ends notched, fit the cross plates into the runners, and fasten them with screws or nails. Then set 3-by-3 iron braces in the angles formed, and screw them to the runners and cross plates, as shown in Fig. 5. Screw a 1-by-2 footbar across the bow of each sled as shown.

Iron runner shoes make a speedier bobsled and protect the wooden runners from wearing. Use a ¾-inch half-oval iron for the shoes (Fig. 5). If your hardware dealer doesn't carry the strips, he will get them for you. Each strip must be drilled for six screws, and the holes must be countersunk so that the screw heads will set in flush with the surface. If you haven't a metal drill-and-countersink, ask a mechanic to do the job for you.

The front bolsters are pieces of 2-by-2 (Fig. 8). Bolt the lower one to the forward cross plate of the bow sled (Fig. 3). The



The method of cutting the runners to shape and several other details of construction are presented.

upper bolster is to be bolted to the reach plank. The rear bolster is a piece of 2-by-4 (Fig. 9), with the top edge beveled off. The bevel is necessary to allow the pivoted stern sled free play. Bolt this block to the forward cross plate of the stern sled (Fig. 4).

Square the ends of the piece of 2-by-10 procured for the reach plank (Figs. 1 and 2), and plane off the sharp edges and smooth them with sandpaper, so that they will not splinter. Cut the three handrail cross strips out of ⅞-inch boards, 3 inches wide and 22 inches long, and bolt them to the under side of the reach plank, in the positions shown in Fig. 2. Then cut the handrails of the dimensions given, round off their edges with a plane and sandpaper, and bolt to the ends of the cross strips.

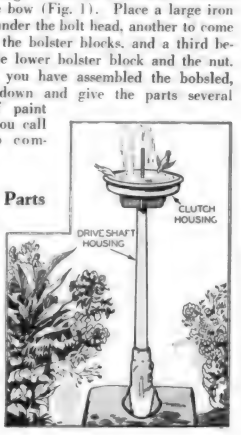
Pivot the stern sled to the reach plank with a pair of heavy 3-by-3 hinges (Fig. 1). Bolt the hinges to the rear bolster, then locate the positions for the hinges upon the reach plank, drill holes for the bolts, and bolt in place. The bow of the stern sled must have check chains, with just enough slack in them to permit the stern sled to follow the contour of the coasting surface (Fig. 1). Use a light-weight hammock chain, or other strong chain. Fasten two pieces to the footbar of the sled, and to a large screw-eye screwed into the under side of the reach plank.

Pivot the bow of the reach plank to the bow sled with a ⅝-inch carriage bolt 8 inches long. Bore the bolt hole 9 inches from the bow (Fig. 1). Place a large iron washer under the bolt head, another to come between the bolster blocks, and a third between the lower bolster block and the nut.

When you have assembled the bobsled, take it down and give the parts several coats of paint before you call the job completed.

Make This Bird Bath Out of Automobile Parts

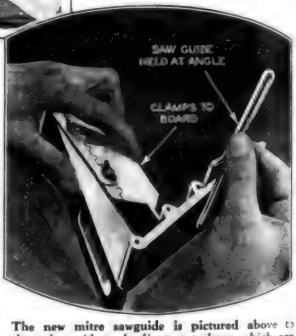
THE bird bath shown in the drawing at the right can be made from a few old automobile parts and a little concrete. The top of the bath is made from the clutch housing of a Dodge car, over the bottom of which the lower crank case cover of a Ford is welded to close the opening, and all bolt holes are welded shut. The pedestal is the drive shaft housing of a Buick. The top of the assembly is filled with concrete so that a shallow basin about two inches in depth is formed. Various parts, as described, can be used from other cars as well as those mentioned. By running an eighth inch pipe through the housing, a connection with the city water supply can be made.—Bennett B. Smith.



New IDEAS in TOOLS

The mitre sawguide which even an amateur can operate with accuracy is shown in use above.

A MITRE sawguide which is easily operated by even unskilled persons, that instantly measures any angle, guides a saw to make an accurate cut, eliminates a T-square and pencil markings, that fits any size saw and may be used on any lumber or molding, is compact and light, and makes possible a perfect fit after cutting, has been placed on the market. The new sawguide is intended to save time and labor and be of value in various kinds of carpentry work. The device has been found to be satisfactory in furniture making.

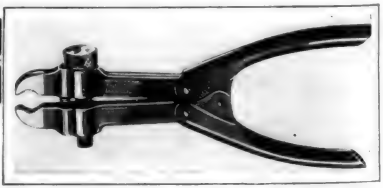


The new mitre sawguide is pictured above to show the guide and adjustment clamp which can be quickly and easily altered to give the saw any desired angle.

Lock Pliers Have One-ton Grip

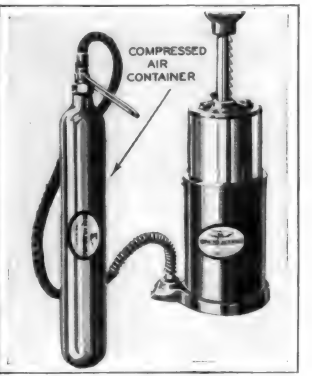
NEW pliers have a new usefulness, the compound leverage delivering a one-ton grip at the jaws which are designed to fit round, square or hexagon objects. An adjusting screw at the jaws enables locking them to any object as you would a hand vise. This arrangement makes the pliers useful for work they never could do before. The jaws are of forged steel, hardened and tempered. The handles are of pressed steel with knurled grips. The pliers are handy for use on battery terminal nuts which have become corroded in place and the corners rounded.

Pliers with locking jaws are pictured at the right and above is demonstrated the means of turning an adjusting screw to lock the jaws. The pliers provide a compound leverage for a one-ton grip.



Save MANUAL LABOR

AN AIR-JACK designed for use of motorists and in garages and service stations is now being marketed. The device is powerful and compact. Cars can be raised to proper height by using the compressed air container and air line as shown in the artist's sketch below. The jack can be connected to a service station air line and operated without the use of the compressed air container, if so desired. The container is particularly useful to motorists on the road and the entire equipment is so compact it can easily be stowed away under a seat with the tool kit. The container can also be used for filling deflated tires. Empty containers are turned in for filled containers at a nominal cost. In using the container it is screwed to the jack hose line and the valve of the container is released very slowly.



The air-jack and compressed air container.

New Shear and Hand Nibbler

A NEW shear and hand nibbler for safe and accurate making of templates and gauges is on the market. It is so accurately designed that it can cut sheet metal into any pattern without necessitating much filing. A few quick, short down strokes do the work. The concave cutting knife shears along any curved line. The semi-circular punch cuts out the corners which are difficult to reach. The nibbler is so designed that the sheared portions of any width metal clear the machine. The device is calculated to save considerable time over older methods and is especially recommended for use in pattern shops and tool rooms when making templates and gauges. It is declared to be capable of cutting sheet metal into any design as easily as a paper shears cuts paper. The device is of all steel construction. It is portable and no mounting is necessary as it fits any vise. Extra blades for cutting intricate shapes are made to order. The shear blades are of high grade tool steel and can easily be removed for sharpening. The blade is 4½ inches long.

The new nibbler is pictured in use above.

Mechanical WIZARDS

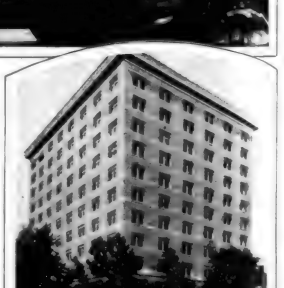
This view shows a few of the 716 employes of the Census Bureau recording and tabulating facts concerning Uncle Sam's 120,000,000 citizens.

By JAMES NEVIN MILLER

THE familiar principle of the perforated paper roll by which player pianos are operated is brought into play by experts of Uncle Sam's Census Bureau to aid in the gigantic task of tabulating the age, sex, and a score of other facts concerning every one of the 120,000,000 individuals who make up the population of the country.

Census facts are gathered by field agents of the Bureau in house to house canvass and forwarded to Washington, where a card is made out for each individual. These cards are punched with holes opposite certain code symbols representing age, place of birth, etc. When punched the cards are run through electric machines which reject them in case any information is lacking, or if there is any inconsistency in the punching. For instance, if a person ten years old has his card punched as being married, it is automatically thrown out.

Punching the cards is in itself a tremendous task which is greatly simplified by the use of special machines developed by Bureau experts. Known as automatic gang punches, they operate at amazing speed, being able to punch an average of 175,000 cards per operator per day. The old type punch used in previous censuses only made a daily average of between 20,000 and 30,000 cards.



In this building at Washington the Census Bureau is even now preparing a card index record of you and your neighbor in the 1930 census.

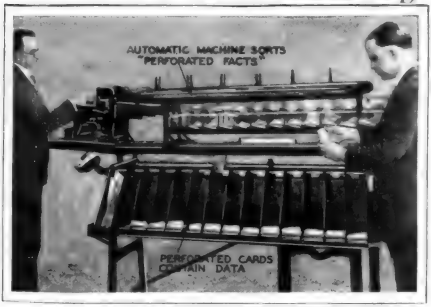
Yet the punching of the cards is in itself only preliminary to the task of classifying

of the CENSUS BUREAU

the information they contain. Here it is that the cards pass through a machine which has been appropriately called the "mechanical wizard," for it does just about everything but sleep and eat. Officially termed the automatic tabulating machine, or unit tabulator, it can be operated at a speed of 400 cards per minute and will record 60 different facts. The punched holes in the cards control the action of the machine in very much the same way that the above mentioned player roll operates a piano, except that in the case of the tabulator the machine is electrical and contacts are made through the punched holes, rather than admitting air through them.

In the base of the machine are counters which tabulate the various kinds of information. When all the cards representing a certain district have passed through the machine, the totals are automatically printed on tally sheets.

The player piano roll is a familiar example of the perforated control system used in tabulating census information. The girl in the photo above is punching holes in cards, taking her information from a schedule sheet wrapped around a cylinder in the front of the machine. The sheet moves forward one line each time a hole is punched. Holes in the cards provide openings for electrical contacts which operate various sections of the tabulating machine the cards pass through. A special machine checks the punched cards for inaccuracies, rejecting them if even one item is omitted.



Perforated cards are automatically sorted by this "mechanical wizard."

Exploding Wedge Devised for Rapid Log Splitting Work

A rail splitter shown using the exploding wedge.

AN EXPLODING wedge which expedites the work of log splitting and permits one man to do a great deal more work with less effort than several men has been devised. In the body of the 12-inch metal wedge is a powder chamber with fuse hole. The powder is concentrated in the shoulder which narrows down to the exploding hole as shown in the accompanying photographs. The wedge is driven into a log in the usual way, deeply enough to have the exploding hole well bedded. Then the fuse is lit and the resultant explosion splits the log.

Cheap Rubber Discovered

A SYNTHETIC rubber that can be made for one-fourth the price of natural rubber has been produced by Dr. E. Kleiber, a Basel chemist according to foreign advices. His method is said to be based on utilization of mineral oils and their residues, and is adaptable for commercial use.

Over Thirty Billion Stars

EVEN our own little corner of the universe contains, says a recent estimate by the Astronomical Society of the Pacific, at least thirty billion stars not unlike our sun. Farther off in space, forming the vast spiral nebulae which astronomers discover by photographs made through the largest telescopes, are hundreds of thousands of times more stars even than the enormous total of our own star cloud, probably also a spiral nebula inside which we live and which we see by looking out through it like a bird inside a cage. The average human eye could see from all parts of the earth, the Society's statement asserts, from 5000 to 6000 stars. These were the only stars known to ancient astronomers. The best modern telescopes aid the eye, the statement continues, to see about 100,000,000 stars, and make it possible to study them.

West Claims Most Beautiful Filling Station in the Entire World

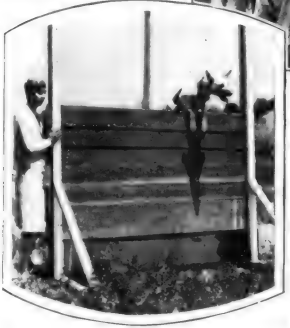
Here is spotless station with attendants dressed in white linen.

DISPENSERS of gasoline and oil at filling stations have come a long way from the day when a gasoline pump at the wayside or curb was considered sufficient to meet the demands of the public. Most filling stations are now artistically designed but it remains for Los Angeles to claim the most beautiful filling station in the world. This station of spotless tile and stone is as immaculate as a bath room. The attendants are garbed in pure white and all of the fittings are kept in excellent condition. The station is located on Wilshire boulevard.

Canine College Has Some Star Pupils in Hollywood

Kay Francis, motion picture actress, is shown conducting a "class in reading" at a Hollywood dog training school where many of the screen's most prominent personalities send their pets to be taught about everything except how to talk.

Julius White, one of the directors of an all-canine comedy for the motion pictures, is shown above rehearsing the company's chorus girls.



One of the students in the dog school is making a practice leap with Miss Francis as audience.

A SCHOOL—the only one of its kind in the world—where dogs are instructed in the best methods of living amicably with their owners, with other human beings and with their fellow-dogs, has been established in Hollywood, California, and rewarded, in the few months of its existence, with an attendance of more than 200 four-footed pupils. No "tricks" are taught, and the animals are not prepared for motion picture work. They are started on how to stand, how to walk, how to sit, how to lie down, how to go up and down stairs, how to open and close doors, how to go through open windows and over fences and walls.

Three-Ton Man-Eating Shark Captured With Pilot Fish

The 28-foot man-eating shark on display.

Power Source in Freezing Water

ICE-POWER to supplement water-power in cold weather, when rivers and waterfalls are likely to be frozen, is the latest idea of the French engineer, M. H. Barjot, who proposed some months ago to the French Academy of Sciences the practical utilization of heat stored in the unfrozen water of Arctic lakes or streams beneath the surface sheet of ice. This unfrozen water remains many degrees warmer, M. Barjot pointed out, than the air of the solid ice at the surface. He now suggests another way of extracting heat from this same water. Whenever a pound of water freezes to a pound of ice a considerable amount of heat is given up, he recalls, just as heat is given up when steam condenses to liquid water. To utilize this heat of freezing obtainable from the water at the bottoms of frozen rivers he proposes an engine and boiler operated by the chemical compound called butane, which is a liquid at the freezing point of water but a gas at ordinary temperatures. In northern countries like Canada or Norway, streams often freeze on their surfaces so that many water-power plants shut down although there is still liquid water underneath. According to M. Barjot's plan this water is to be pumped into a "boiler" containing cold liquid butane. The water will freeze and give up heat. This heat will boil the butane into gas. The butane gas will then operate an engine and finally will be cooled back to liquid by the cold of the surface ice and the air.

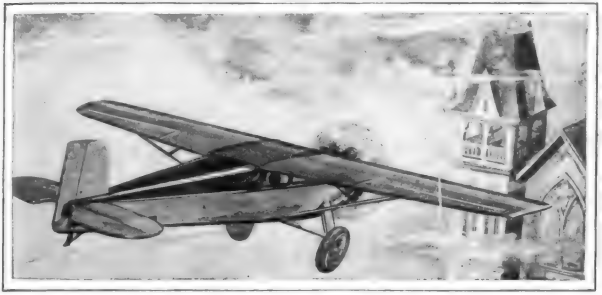
IT TOOK the crews of two fishing vessels 9 hours of battling to capture a 28-foot, 6,000-pound man-eating shark off Santa Cruz, California, recently. The shark, a female, swam into the nets and after it threatened several times to swamp the small vessels, a shot in the head from a small cannon ended the fight. The shark was put on display with a pilot fish and attracted large crowds in San Francisco. The small pilot fish shown on the head of the shark at the left is credited with being a natural spy. These small fish are reputed to lead sharks to their prey. After the shark has made a killing the pilot fish will feed on parts of the victim torn loose in the attack. It is claimed that the pilot fish will locate a school of fish, dart down to the shark at lower depths and swim ahead to lead the shark to the school, thus betraying other smaller fish.

Mirror in Cap for the Sheik

MODERN youth has solved the problem of the embarrassing necessity for carrying his mirror, for on sale at various men's stores in London is a novel cap inside which is a mirror. All a young man must do is doff his cap to see whether his hair is nicely slicked and whether he is entirely presentable.

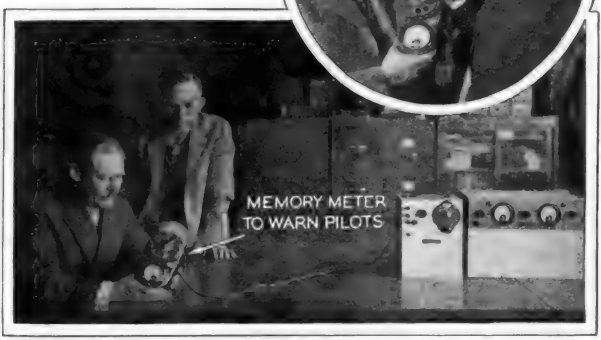
Youth giving himself a treat in his cap-mirror.

Radio Memory Meter Warns "Blind" Aviators of Danger



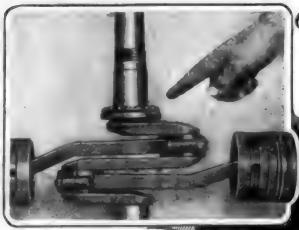
An artist's conception of an airplane flying through fog which will be warned of the steeple in its path by the memory meter.

BLIND flying such as was recently accomplished by Lieutenant Jimmy Doolittle will be simplified by the new memory meter radio device which acts as a depth sounder and transmits a radio wave and preserves the echo as a warning signal. Colored lights flash to indicate the ship's altitude and warn pilots of obstacles in their path.

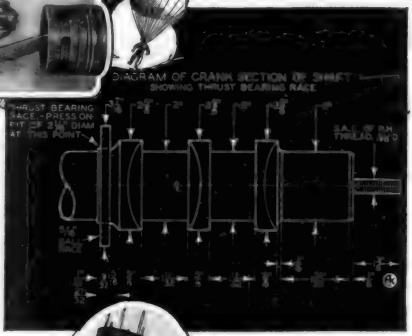


Experimenters are shown with the radio memory meter for depth sounding from planes to warn pilots.

Rebuilding



This is the way the finished conversion will look before it is installed in the engine.



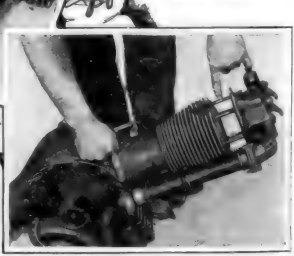
AFTER the war there were a good many surplus airplane motors put on the auction block by the government. Among these there was one model which sold very cheaply; namely, the Lawrence C-2 28 h.p. Penguin training plane motor which was used to power the clipped wing machines used to acclimate the aviators who were rushed through the ground schools of that day.

Because the machines never flew, in fact were designed not to, the engines were built with but one throw in the crank shaft. This at their 2000 r.p.m. speed caused so much vibration that light-plane users, having picked up motors at anywhere from $75 to $125, found they could not use them in light 500 lb. planes without shaking the fuselage to pieces.

Today there are a lot of these new and unused engines available for low prices.

Above you'll find a side view mechanical drawing of the Hickman crank design which will give finished measurements for the diameters and web spacings. This fits into the space occupied by the original one-throw crank and makes a true opposed motor for light planes.

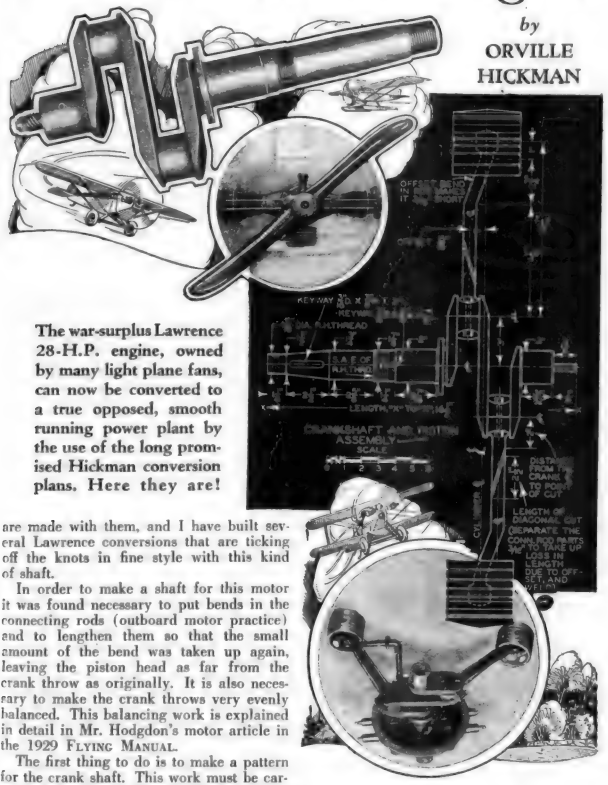
The two throw crankshaft can be fitted in nicely in all these motors and will not only increase the r.p.m.'s considerably, but the engine will fly smoothly, like a Bristol Cherub or a Scorpion. The chrome vanadium casting is more than amply strong, and will give good service. Cast crankshafts are nothing new—most farm engines



Don't experiment with souped up piston clearances because the head must go back into its original place to allow the manifolds to fit.

the LAWRENCE Engine

by
ORVILLE
HICKMAN



The war-surplus Lawrence 28-H.P. engine, owned by many light plane fans, can now be converted to a true opposed, smooth running power plant by the use of the long promised Hickman conversion plans. Here they are!

are made with them, and I have built several Lawrence conversions that are ticking off the knots in fine style with this kind of shaft.

In order to make a shaft for this motor it was found necessary to put bends in the connecting rods (outboard motor practice) and to lengthen them so that the small amount of the bend was taken up again, leaving the piston head as far from the crank throw as originally. It is also necessary to make the crank throws very evenly balanced. This balancing work is explained in detail in Mr. Hodgdon's motor article in the 1929 FLYING MANUAL.

The first thing to do is to make a pattern for the crank shaft. This work must be carried out very carefully, or by a pattern maker. It must be enough larger so that there is metal to cut and trim the casting. The pattern can be made of white pine,

Top, the finished two throw crank. Bottom, showing cored hollow throws for oil passages. Castings for this crank can be obtained by amateurs wanting to make their own. See article.

Here's an Alco Sportplane, plans for which were published in the 1930 edition of the Flying Manual. This ship was built by a Modern Mechanics reader from these plans. It shows the installation of the Lawrence engine which develops the usual 28 h.p. and gives the ship a performance somewhere between that of the old Jennies and the modern Wacos.

which is soft and easily worked, and makes very nice patterns.

On each end of the shaft pattern leave in the center end shaft a small round piece of wood which extends for about 1½-inch for the lathe chucking operation. Holes can be cored in the shaft or can be drilled later for the oil ducts, just as you desire. The shaft shown in the drawing was cored with ¾-inch cores so that drilling was not necessary.

The shaft can be of cast mild steel, chrome vanadium, or nickel steel, but chrome vanadium steel is recommended, as this is what I used, and have had good success with.

After you have your casting, then the thing to do next is to study the drawing carefully. Turn down the shaft to nearly the required size, then cut the threads and keyways and bore the shaft for the force feed oiling system. If possible the shaft should be sent through your local garage to a machine shop in a large town where it can be ground to size by grinding. This is not a too expensive operation and will be well worth the trouble it costs you. Otherwise the shaft may be finished up in the lathe with the very finest of finishing cuts so that you get a mirror-like finish on the bearing surfaces.

On the plan view of the crank, though no oil holes are shown, so as to avoid confusion in reading the drawing, a ¾ or 1-inch hole is bored from the front end of the shaft X to the web behind which is the designation c-1. Then holes are bored into the webs, the cored holes plugged, and the bearing surfaces tapped where the bearing caps for the con rods are. These oil taps should be on the outside of the throw or centrifugal force will work to keep the oil from the bearing. Remember this: The oil holes for the bearings must be on the *outside* of the throw.

Next we have the connecting rods to cut and bend to shape. After bending they must be cut in two and welded again. This is a simple procedure if planned before started. Take the rod out of the piston and place in an old wrist pin. Place the pin in a vise and apply heat on the rod one inch from the center of the pin forward toward the connecting rod end. The best way to apply this heat is with an oxyacetylene torch, but if this is not at hand, heat the rod in a forge to a cherry red heat and bend out to a template. This should be so that a point 3¾ inch from the pin is offset 15/16 from the original center.

Then it is next necessary to lengthen the rods some, because the bend we placed in them has shortened them up a bit. Cut the rod off on a 2½-inch diagonal cut so as to avoid a butt weld which is not very efficient. The rod after the cut is moved just 3/16-inch apart and the gap lap welded with the acetylene torch. This part of the work must be handled by an experienced welder.

(Continued on page 202)

MOTOR MECHANICS

Edited by RAY F. KUNS

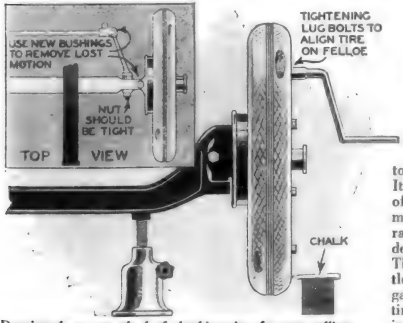
Mr. Kuns, editor of this department, is principal of the Automotive Trade School of Cincinnati, Ohio, and a nationally known expert in his field. He is also editor of the Automobile Digest, national auto trade journal. This department of motor hints is a regular monthly feature of Modern Mechanics and Inventions.

Correcting Flat Spots on Low Pressure Front Wheel Tires

AFTER several thousand miles of use the front tires of the car frequently show small flat spots, and as the mileage increases these spots grow deeper and finally the fabric is cut through. Observations made in tire service stations disclosed the fact that flat spots on front tires occurred on wheels where the tires were out of true, due to irregular tightening of the rim lugs.

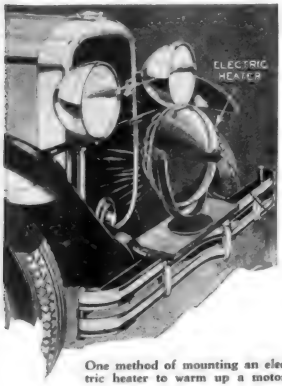
To check the front tires for true rolling, it is only necessary to place a jack under the axle, as shown, and place a piece of chalk on a block alongside the tire which marks the high spots as the wheel is revolved. Through use of the rim lugs, the bolts are loosened and the tire position adjusted enough by this means to make it run true. To take out play or lost motion, which would allow wheel wobble on the axle yoke and in the cross link of the steering gear, is a matter mainly of bushing renewals. Wheel bearings can usually be adjusted to take out play.

The spindle arm is often secured with a nut and cotter pin. This should be an absolutely tight joint to keep the wheels aligned. It is possible to obtain for some of the light weight, popular make cars, small springs, anti-rattle bolts, and other special devices to help take out play. These adjustments require little skill or time, and the owner gains not only an increase in tire mileage, but increased ease in steering the car.



Drawing shows a method of checking tires for true rolling.

Electric Heater Helps Start Car by Warming Cold Motor



One method of mounting an electric heater to warm up a motor.

SOME cars are hard to start when the engine is cold. This is especially true of some of the new cars which have not been run in enough to have them turning over freely when the cold weather hits them.

Most homes are equipped with an electric heater which works on the reflecting principle. These heaters may be used in a variety of ways to help in warming up the engine.

They may be set on the front of the car on a board or the hood may be raised and the heat directed against the carburetor. Some drivers imagine that because a car is equipped with a heat control device for handling fuel that it ought to start easily under any conditions of temperature or poor fuel. They forget that in most cases no heat is available until the engine is running. The only exceptions to this are the few cars equipped with electric vaporizers or fumers.

If the heater is used from the front of the engine with the automatic shutter, this will have to be blocked open. A better plan is to raise the hood and work from the back of the radiator and allow the shutter to remain closed.

Heat in the radiator will usually warm the engine gradually, as there will be some circulation of the cooling solution. When the engine is warm the starting motor has a better chance as the oil is no longer so stiff and hard to turn over.

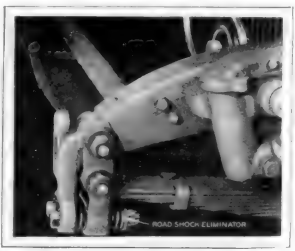
The same device may be used in an emergency to prevent the car freezing in moderately cold garages.

Eliminating Steering Gear Shocks

EVERY seasoned motorist knows the characteristic shock which is transmitted from a road bump back through the steering gear and to the steering wheel. Much improvement has been effected by changing the gear ratio of the steering gear and also by designing and utilizing different types of gears. The most recent development designed to eliminate this road shock is the road shock eliminator now being fitted to several of the General Motors cars. The one illustrated is fitted to the 1930 Buick.

The device is placed on the left side of the car at the front end of the front spring. A special casting is fitted to the horn of the left side frame member. Two bolts are fitted to the lower end of this horn and four coil springs are mounted on the bolts with the lower end of the specially designed spring shackle being secured between them.

The shock eliminator or steering modulator cancels the effect of the front wheel shimmy or tramp, while at the same time eliminating the road shock from the steering wheel. The gyroscopic force which is set up at automobile wheels at high speeds is neutralized. A small amount of motion between the coil springs is allowed for.



With this spring device, steering gear shock is eliminated.

The SHOP MAIL BOX

In this department the Editors of the good ship Modern Mechanics pass along the interesting highlights encountered in their work of gathering all the good things that make the magazine. You'll meet old friends here—and let's hear from you, too!

THE gliders seem to be growing in popularity each month. The Duede glider, published in the first FLYING MANUAL, and the Northrop Glider, published in the second FLYING MANUAL, have struck responsive chords in the minds of many readers.

The popular impression seems to be that gliders are easy to fly. They are, but just what "easy" implies is hard to classify. No flying is more trying or requires more quickness than the flying of a light powered plane. The glider is in the same class. And this does not mean that light planes require a superman to fly them; it merely means that light planes are more given to that abstruse aerodynamical term known as "floating" than are the large, high powered streamline bricks that so many of the transport ships are. Anybody can fly if there is power enough to snake a fellow out of the holes. A flyer is needed at the stick of a light ship—but the idea that he must be a superman, or other than a good tenhour flyer is ridiculous.

Here's a letter with a couple of photos.

Modern Mechanics and Inv.
Editorial Dept.
Robbinsdale, Minn.
Gentlemen:

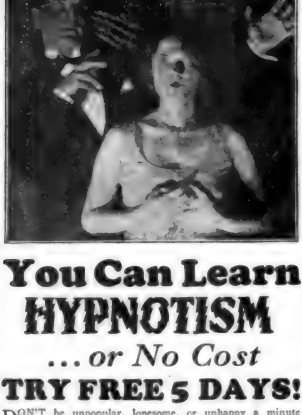
I have taken a couple of pictures in our workshop of the Chicago Glider Club, that might be of interest to you and your readers. The one picture shows two of our members placing the ribs on the spar of our primary glider. The other shows the president, Mr. Hess, in the center explaining the rib detail of the Northrop Glider which appeared in your magazine, and which we expect to build this winter.

We all read your magazine and find the construction articles very interesting and instructive, however at present we are limiting ourselves to building gliders.

Very truly yours,
J. Y. Guinter,
Vice Pres.

(Continued on page 170)

In this snap shot duo you see J. Y. Guinter, Vice Pres. of the Chicago Glider Club, using Modern Mechanics to explain some points on wing rib construction, and members at work on a glider.



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DON'T be unpopular, lonesome, or unhappy a minute longer. Now you can make your life what you want it to be—now you can win admiration, success and big money—through the strange power of hypnotism. I'll show you how to use this great force to help you master every situation or *The Five Day Trial is FREE!*

In just a few hours I'll teach you the hidden secrets of Hypnotism—the methods used by the great operators—the amazing things you can accomplish once you understand this mighty power. You can use it to overcome obstacles, achieve your fondest ambitions and become MASTER of yourself, friends and acquaintances—either sex.

See for yourself how Hypnotism can banish fear, worry and opposition—improve your memory—increase your earnings—and force others to give you the good things in life you deserve!

In the startling 32,000 word book, *The Science of Hypnotism*, the world famous hypnotist—Prof. L. R. Young—reveals the most carefully guarded secrets of this fascinating subject. He not only explains the methods of noted hypnotists, step by step—but tells clearly all about the nine stages of Hypnotism, the Hypnotic Mirror, Mental Telepathy, how to select your subjects, magnetic healing, methods of hypnotizing, how to weaken the subject, how to make money out of hypnotism!

Mysteries of Hypnotism Revealed

How to Hypnotize at a Glance.
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How to Hypnotize by Telephone.
How to Give an Entertainment.
How to Make Others Obey You.
Overcoming Bad Habits.
How to Do Dozens of Hypnotic Feats.
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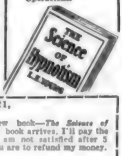
So confident are we that Prof. Young and his great book will quickly teach you the science of hypnotism, that we will send you a copy without one cent in advance! Simply clip and mail the coupon below. When the book arrives pay the postman the special low price of $2.50 plus few cents postage. Then test the powers of Hypnotism 5 days! If not amazed and delighted return the book and money will be refunded at once. Mail the coupon now.



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Please send me your amazing new book—*The Science of Hypnotism*—by Prof. Young. When the book arrives, I'll pay the postman only $2.50 plus postage. If I am not satisfied after 5 days' trial, I may return the book and you are to refund my money.

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Letters from the Shop Mail Box

(Continued from page 169)

Here's the letter we sent in reply:

Mr. J. Y. Guinter,
Chicago Glider Club,
4250 West 21st Place
Chicago, Illinois
Dear Mr. Guinter:

We are very much obliged to you for sending us the photos of the Chicago Glider Club in operation, particularly as to the shot showing Modern Mechanics in use. We are entering those for early publication.

Yours to the ceiling,
THE EDITORS.

YOU MODEL Making fans will be interested to see the portrait of Kenneth Bronaldo Murray, contributor of many of the good features carried by MODERN MECHANICS. In this issue Mr. Murray has an article called "Building a Model Rocket Plane." Even shows how to make the rocket yourself!

Kenneth Bronaldo Murray

My 200 Passenger Plane

(Continued from page 47)

DO.X in this respect, with its airscrews 18.9 feet above the waterline. This is equally important for the engines. In the 1926 seaplane meeting at Warnemunde a DO.E type flying boat was taking part in competitions when a wave broke over the engine, filled the carburetor with water and put the engine out of action, just when full power was required for getting off.

In the DO.X type pilots and mechanics are increasingly safe from seas washing over their positions. At the same time, comfort, endurance and ability to carry out repairs in rough weather are all increased.

These figures, admittedly, enable us to form no final judgment as to the economic value of the new type. I will have to wait until the DO.X is used in the regular air traffic before I will really be in a position to say that the ton-kilometer costs so-and-so much with DO.X. Then I will be able to

(Continued on page 178)

Thank You for Mentioning Modern Mechanics and Inventions for February When Writing to Advertisers

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EAGER power under instant control — speed that leaves the car-parades behind—lightning response to throttle and brakes —these are just a few of the thousand thrills of motorcycling. Ask any Harley-Davidson rider—he'll tell you of dozens more. And they are all yours at low cost, in a Harley-Davidson "45"—the wonderful Twin at a popular price.

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Mail the Coupon!

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RIDE A HARLEY-DAVIDSON

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Interested in your motorcycles.
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My age is ☐ 16-19 years, ☐ 20-30 years, ☐ 31 years and up, ☐ under 16 years. Check your age group.

LUMINOUS PAINT

Make Your Watches, Clocks, Etc., Visible by Night The very latest discovery in the scientific world. Hitherto, previously mechanical means in producing this material is the only method known. THE DARKER THE NIGHT, THE MORE BRIL-LIANT IT SHINES. Quite simple to use. Anyone—you can do it. A little applied to the dial of your clock will enable you to tell the time of night without getting out of bed. Apply to your electric lights, match boxes and innumerable other articles; make your own Luminous Crucifixes, Luminous Rosaries, etc. Small bottle, prepaid, 25c. Larger size, 50c and $1 prepaid. JOHNSON SMITH & CO. Dept. 949 RACINE, WIS.

CIGARETTE MAKER

Roll your own and save money. Better smoke, better taste than the high priced tobaccos. Neat, useful, handy. Pocket size, weighs 1¼ oz. Made entirely of nickel plated 20c, 3 for 50c postpaid. JOHNSON SMITH & CO.

GOOD LUCK RING

Very striking, quaint and unusual design. Silver finish skull and crossbones design. Set with brilliant, fiery sparkle gem of the very latest cut. Sold to us by a ring manufacturer. Only 25c, postpaid.

Exploding Cigarettes

Box contains ten genuine cigarettes of excellent quality. They appear so real, but when one attempts to smoke a cigarette, the action gets a very great surprise at the explosion that follows. A great mirth provoker par excellence. Harmless. Postpaid, 10c.

NOVELTY BADGES

Kissing Parrot 10c Carter Inspector 10c

Two pretty and metal badges nickel plated, that you can wear, giving you fun out of all proportion to their cost. 10c, each badge, 3 for 25c, or 75c per dozen, postpaid assorted.

SURPRISE MATCHES

More fun than fighting with your wife. Look like ordinary matches. Put up in boxes just like reg-ular matches. At the victim tries to light one he gets quite a surprise. Price 10c per box, 12 for 75c postpaid.

MIDGET BIBLE

GREAT CURIOSITY. Sensational. Unbelievable. Yet true. Size of a postage stamp. Contains 300 Pages. Printed in good black type. Can be read by the aid of a magnifying glass. Words are as plain as can be expected. Make good money selling them to friends. Curio acquaintances. Send 10c for sample. Per 100 $1.25, 1000 for $7.50. Also obtained in 50 page book, size 1½ x 2 inches. Price 10c each, 3 for 25c, 12 for 75c postpaid. Write for terms allowed for use with Midget Bible 75c.

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is a little instrument that fits in the mouth out of sight. Cannot be detected. It is used in connection with the above, and with the aid of this wonderful DOUBLE THROAT, or VENTRILO, you can imitate many kinds of birds, animals, etc. Remember you get everything for ONLY TEN CENTS—a booklet giving you full instructions how to become a ventriloquist and throw your voice, the Double Throat, or Ventrilo, and our big 600 page catalog of novelties, tricks, puzzles, masks, books, etc., **10 cents**

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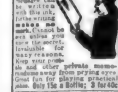
Rubber Chewing Gum

It is just like a regular package of chewing gum and looks so natural that it fools everybody. Of course no one suspects it is not genuine until they start to chew it. There's a world of fun in this rubber chewing gum package. Price, 10c Pkg.; 3 for 25c, postpaid.

Rubber Tacks ..... Box 1c; Rubber Cigarettes, Price per Box, 20c
Rubber Cigars, Price Ea., 10c; Rubber Matches, Price per Pkg., 10c

U. S. BABY TANK

25 Cents



It goes with real Yankee Pep—by its own power

Most remarkable toy ever invented. By pressing the Tank backward, either with the hand or by pushing it down on the floor, it will travel along, overcoming obstacles in the same lifelike manner as the larger Tank that proved so deadly in the great war. What makes it go is somewhat of a mystery, for there is no mechanism to wind up. You simply understand it's hard to get. Merely place the point of the barrel of the pistol into a potato, as shown in the illustration, withdraw the pistol and fire. Nothing could be simpler. It fires quite a distance, goes off with a report like all air guns, and throws a potato missile that will make anybody sit up and take notice. Without question the most powerful toy pistol ever offered for the price. Only 25c.

tops, yet this tank will keep plodding along ten times longer than the ordinary run of toys. Comes in assorted colors. A most wonderful seller. 25c value. Price only 25c prepaid. Stamps accepted.

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THE NEW POTATO PISTOL

This is surely the most ingenious of all toy pistols. *NO AMMUNITION AT ALL YOU NEED IS AN ORDINARY POTATO*, and that isn't hard to get. Merely place the point of the barrel of the pistol into a potato, as shown in the illustration, withdraw the pistol and fire. Nothing could be simpler. It fires quite a distance, goes off with a report like all air guns, and throws a potato missile that will make anybody sit up and take notice. Without question the most powerful toy pistol ever offered for the price. Price Postpd. Only 25c.

Great Fire Eater

A great trick by which you can apparently breathe fire from mouth, to the horror and consternation of all. Quite harmless. All apparatus necessary sent complete in box for ONLY 30c. p. pd. JOHNSON SMITH

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A REAL STARTLER. This is the most popular of all squirt tricks. Flower in your coat looks so fresh and sweet that everyone is tempted to inhale the delightful perfume. Then is the moment to press the bulb. Gosh-a-biscuit. Don't they jump? There is a very long rubber tube hidden in the stem of the flower and when the bulb is squeezed the bulb is large enough to make a dozen shots with one loading. PRICE 25c, each, or 3 for 60c postpaid.

SEEBACK ROSCOPE

Place this clever instrument to your eye, point at any object and it seems to be looking back. Very interesting and mystifying. Everybody wants to see it. Only 20c postpaid. No one thinks you are looking. Just like looking open at the back of your head. PRICE 25c POSTPAID

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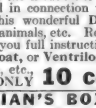

ANYONE CAN DO THEM

It is great fun mystifying your friends. Get this Conjurer's Cabinet, and you will be the cleverest fellow in your district. It contains the apparatus for ten first-class tricks, including The MAGIC BALL AND VASE TRICK in wooden ball is placed inside, and upon replacing the lid has disappeared and is found in the performer's pocket; The HINDOO TRICK. Cards can be made to appear in a solid plate of glass, and then disappear; The INQUIRING BOX trick, placed in the mysterious box, vanishes entirely or changes into a coin of another denomination; The GLASS GLOBE LET TRICK (a coin is dropped into a glass of water and when the water is poured out the coin has vanished and is found somewhere else); The RIBBON FACTORY TRICK or THE MOUTH TRICK is seemingly endless supply of colored paper ribbons comes from your mouth; The MYSTIC CARD TRICK, The MYSTIC RING TRICK, The RISING CARD TRICK, The CHANGED BOTTLE (no one but yourself is able to make it lay down); the GREAT HAT AND DICE TRICK (a large dice is placed on top of a hat, disappears, and is found underneath, yet no one has touched the hat), and last, but not least, the GREAT PHANTOM CARD TRICK, or two from five leaves nothing. Full instructions are sent for performing each trick. In addition to the above, a number of other feats and illusions are fully explained, so that you can entertain your friends with the necessary apparatus. Price complete $1.00 postpaid. JOHNSON SMITH & CO.

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Dancing Made Simple as A-B-C

You will be surprised to see how easily you can learn to dance by our simple chart system. Every dance is explained step by step with charts and diagrams. You can't possibly go wrong. The directions are so easy to follow, and the pictures are so clear, that you'll be dancing before you know it.

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If you want to become a perfect dancer—if you want to be popular—learn to dance at home this new, easy way.

Think of the Good Times You Are Missing

Every time you turn down an invitation to a dance, you are missing hours of fun, enjoyment and pleasure. Dancing is the best of the social accomplishments. If you are a good dancer, you will be the most popular person in your set, and get invitations to all the parties. Why not learn to dance and share the splendid times others are enjoying?

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Just send your name and address and we'll send the complete course—823 pages, 49 illustrations, by return mail. When the postman hands you the book, pay him only $1.98, plus the delivery charges. Try the course for 5 days. Then if not satisfied, return it and your money will be refunded. Mail your order now!

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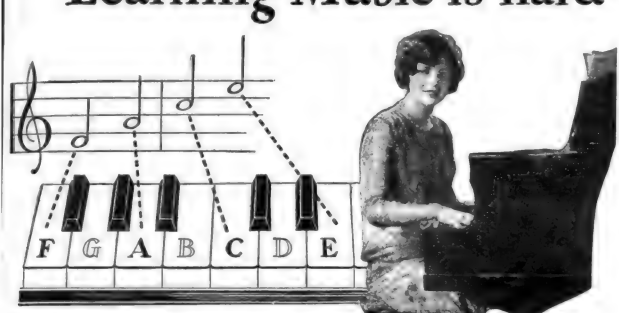
To those who think Learning Music is hard-



PERHAPS *you* think that taking music lessons is like taking a dose of medicine. It isn't any longer!

As far as you're concerned, the old days of long practice hours with their horrid scales, hard-work exercises, and expensive personal teachers' fees are over and done with.

You have no excuses—no alibis whatsoever for not making your start towards musical good times *now!*

For, through a method that removes the boredom and extravagance from musical lessons, you can now learn to play your favorite instrument entirely at home—without a private teacher—in half the usual time—at a fraction of the usual cost.

Just imagine . . . a method that has made the reading and playing of music so downright simple that you don't have to know one note from another to begin.

Do you wonder that this remarkable way of learning music has already been vouched for by over a half million people in all parts of the world.

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The lessons come to you by mail from the famous U. S. School of Music. They consist of complete printed instructions, diagrams, and all the music you need. You study with a smile. One week you are learning a dreamy waltz—the next you are mastering a stirring march. As the lessons continue they prove easier and easier. For instead of just scales you are always learning to play by *actual notes* the classic favorites and the latest syncopation that formerly you only *listened* to.

And you're never in hot water. First you are *told* how a thing is done. Then a picture *shows* you how, then you do it yourself and hear it. No private teacher could make it clearer or easier.

Soon when your friends say "please play something," you can surprise and entertain them with pleasing melodies on your favorite instrument. You'll find yourself in the spotlight—popular everywhere. Life at last will have its silver lining and lonely hours will vanish as you play the "blues" away.

New Friends—Better Times

If you're tired of doing the heavy looking-on at parties—if always listening to others play has almost spoiled the pleasure of music for you—if you've been envious because they could entertain their friends and family—if learning music has always been one of those never-to-come-true dreams, let the time-proven and tested home-study method of the U. S. School of Music come to your rescue.

Don't wait until you begin your lessons at once. Half a million people learned to play this modern way—and found it easy as A-B-C. Forget that old-fashioned idea that you need special "talent." Just read the list of instruments in the panel, decide which one you want to play, and the U. S. School will do the rest. And bear in mind no matter which instrument you choose, the cost in each case will average the same—just a few cents a day. No matter whether you are a mere beginner or already a good performer, you will be interested in learning about this new and wonderful method.

Pick Your Instrument

Piano	Violin
Organ	Clarinet
Ukulele	Flute
Cornet	Saxophone
Trombone	Harp
Piccolo	Mandolin
Guitar	'Cello
Hawaiian Steel Guitar	
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Send for Our Free Book and Demonstration Lesson

Our wonderful illustrated Free Book and our Free Demonstration Lesson explain all about this remarkable method. They prove just how anyone can learn to play his favorite instrument *by note* in almost no time and for just a fraction of what old slow methods cost. The booklet will also tell you about the amazing new *Automatic Finger Control*.

Read the list of instruments to the left, decide which you want to play, and the U. S. School of Music will do the rest. Act NOW. Clip and mail this coupon today, and the fascinating Free Book and Free Demonstration Lesson will be sent to you at once. No obligation. Instruments supplied when needed, cash or credit. U. S. School of Music, 2622 Brunswick Bldg., New York City.

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Please send me your free book, "Music Lessons in Your Own Home," with introduction by Dr. Frank Crane. Free Demonstration Lesson and particulars of your easy payment plan. I am interested in the following course:

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"The bigger they are, the harder they fall," said crafty Bob Fitzsimmons—he knew that science beats mere brute strength every time.

You can go up against much bigger and stronger men and beat them to a frazzle *if you know the science of boxing.*

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The Marshall Stillman System of teaching is based upon the principles of boxing employed by the world's best fighters. You will marvel at how easy it is to strike punishing blows, to guard, feint, duck, block, *when you know these principles.*

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The course includes a complete set of Muscle-building and Breathing Exercises with instructions on Training.

JIU-JITSU AND WRESTLING. The lessons we give you in Jiu-Jitsu will teach you how to cripple any thug you may encounter—disarm him, break a strangle hold, throw him if he grabs you from behind. In Wrestling you are taught the best holds, such as the Goich Toe Hold, the Bleeker Scissors Hold, the Headlock, etc.

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The Quickest Surest, Easiest Way!

Everywhere you hear people say, "GET INTO AVIATION NOW—IT'S GOING TO BE THE BIGGEST BUSINESS IN THE WORLD!" What are YOU doing about it? Don't you know what your next step should be? I'LL TELL YOU! I'll show you how to break into aviation the Quickest, Easiest Way!

Be a Radio Telegraph Operator!

EVERYBODY is excited about aviation! You hear all kinds of advice. "Be a pilot" say some. "Take a course in ground mechanics" recommend others. That's how it goes. Everybody realizes that a tremendous, fascinating business is "mushrooming" under his very feet. But the *tragic part* is that nobody knows just what he should do to "break into" aviation *quickly* and *easily!* Yes you and everybody else knows they should do SOMETHING!

BIG FIELD IS WIDE OPEN

Luckily, there is an amazing field open for the fellow who wants to get into aviation NOW.

Let me tell you why! Aviation will only be safe when planes can be in constant communication with land. That is evident. It is the only way to avoid crashes and flying uncertainties. Big aviators like Lindbergh, Byrd and others say so. Experts confirm it. U. S. Government outlines this to be a *fact*.

Now, RADIO TELEGRAPHY is the *only* way to communicate between land and air. Radio telegraphy is the Morse or Continental code, just as used by railroads, etc. Except that in the air, it is transmitted and received *without* landlines.

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Already many planes are equipped with code apparatus. Passenger-and-commercial lines demand it. For safety's sake, the U. S. Government may even make it a law that aeroplanes must be equipped with telegraph equipment.

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To fill these positions, you only need a knowledge of the code. Strangely, this code is not difficult to learn. In fact, since the invention of the famous Teleplex, the master instructor, *it is quite simple!*

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My 200 Passenger Planes

(Continued from page 170)

compare her with other airplane types and decide whether DO.X comes up to the expectations I have of her from the economic point of view. But one must have time for all this. For the moment we must be satisfied with the great engineering success—and hope for the best.

At the moment we are carrying out tests with crude oil engines at the wharf at Friedrichshafen. If the results are good—the fuel consumption of the Diesel-crude-oil-aeroplane-engine only amounts to 3.9 pounds per h.p. hour—the DO.X, equipped with engines of this kind, would have a radius of action of about 3600 miles.

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1. What is the largest seaplane? (See page 100)

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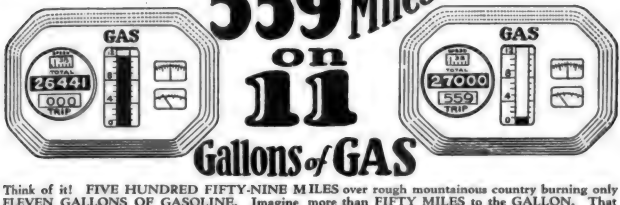

Think of it! FIVE HUNDRED FIFTY-NINE MILES over rough mountainous country burning only ELEVEN GALLONS OF GASOLINE. Imagine more than FIFTY MILES to the GALLON. That is what the WHIRLWIND CARBURETING DEVICE does for D. R. Gilbert, enough of a saving on just one trip to more than pay the cost of the Whirlwind.

THE WHIRLWIND SAVES MOTORISTS MILLIONS OF DOLLARS YEARLY

Whirlwind users, reporting the results of their tests, are amazed at the results they are getting. Letters keep streaming into the office telling of mileages all the way from 22 to 59 miles on a gallon, resulting in a saving of from 25% to 50% in gas bills alone.

Mark H. Estes writes: "I was making 17 miles to the gallon on my Pontiac Coupe. Today, with the Whirlwind, I am making 35 3/10 miles to the gallon. Am I glad I put it on? I'll say so!"

P. F. Goersen writes: "I made an actual test both with and without a Whirlwind, getting 13½ miles without and 34 6/10 miles with the Whirlwind, or a gain of 21 miles to the gallon. The longer the Whirlwind is in use on the machine the better the engine runs, has more pep and quicker starting. It makes a new engine out of an old one, and starts at the touch of the starter button."

R. J. Tulp: "The Whirlwind increased the mileage on our Ford truck from 12 to 26 miles to the gallon and 25% in speed. We placed another on a Willys-Knight and increased from 12 to 17 miles per gallon."

Arthur Grant: "I have an Oakland touring car that has been giving me 15 miles to the gallon average, but I can see a great difference with the Whirlwind, as it climbs the big hills on high and gives me better than 23 miles to the gallon of gas, which is better than 50% saving in gas."

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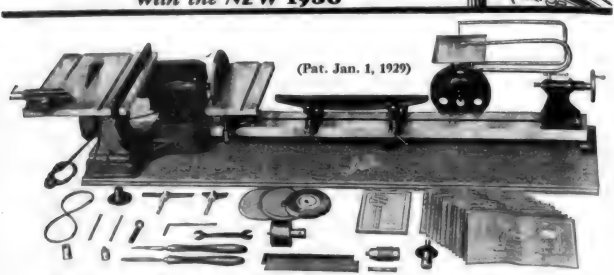

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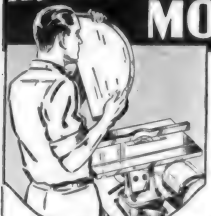

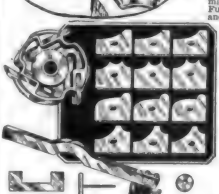

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This new "Delta" moulding cutter is taking woodworkers by storm. And no wonder! At the amazingly low price of $15.00—here is offered for the first time a practical moulding cutter—safe and efficient—that incorporates numerous features previously found only in the most expensive tools.

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Produces Beautiful Work

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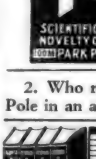
2. Who recently flew over the South Pole in an airplane? (See page 100)



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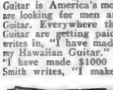
The haunting, soft, melodious strumming of the Hawaiian Guitar is America's most popular music. Everywhere orchestras are looking for men and women who can play the Hawaiian Guitar. Everywhere those who have mastered the Hawaiian Guitar are getting paid more and more money. Roy Reibane writes in, "I have made $200 extra money in 6 weeks playing my Hawaiian Guitar." Carelton E. Scarbro recently wrote me, "I have made $1000 since I took your course." Granville Smith writes, "I make $8 a night and play only 4 hours."



Dozens of such letters have come in. But let me tell you about my short-cut to good times and big pay—my simplified method of learning to play the Hawaiian Guitar at home in a few weeks. A new method—so easy to understand—so much fun to learn—that even a child can pick it up. (We have successfully taught children only 8 years of age.)

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Pictures Instead of Words, Teach You

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By far the most important aspect of rejuvenation is health . . . freedom from pain, weakness, debility and certain distressing and often painful symptoms so common to old age.

So little is generally known about the subject of glands that it would probably amaze many men to learn that most of their suffering and distress oftimes is due to the failure of the tiny prostate gland.

Symptoms of Prostate Trouble

When this vital gland slows up in men past middle age it often hypertrophies—and becomes congested, swollen and greatly increased in size. In this condition it often bears or presses on the bladder and colon—thus directly causing severe bladder trouble, frequent nightly risings, broken sleep, and, not infrequently, both chronic constipation and hemorrhoids.

Do You Suffer Any of These Distressing Symptoms of Debility and Breakdown?

After age 40, do you suffer any of these distressing symptoms of gland disorder?

- Frequent Nightly Risings . .
- Backache . . . . Weakness . .
- Foot and Leg Pains . . . .
- Chronic Constipation

Are You Blaming These Troubles on Approaching Age?

Prostate trouble is also the frequent cause of debility, weakness, pains in the back, feet and legs, chronic fatigue, and a general lack of ambition, a feeling of age, depression and irritability. This is prostate trouble. Few people realize how widespread it is. Some medical men believe, however, that fully two-thirds of all men past middle-age—and many much younger than 40—have some or all of these symptoms of gland disorder. Untold thousands of aging men suffer in this way and do not know the cause. For the most part they blame these troubles on approaching age.

There is no medicine known which can reduce the prostate gland to normal size. Palliative treatment is by finger massage and physio-therapy methods. When the gland swells beyond the ability of palliative measures to correct, the only alternative is to remove it which is a serious surgical operation every man would like to avoid.

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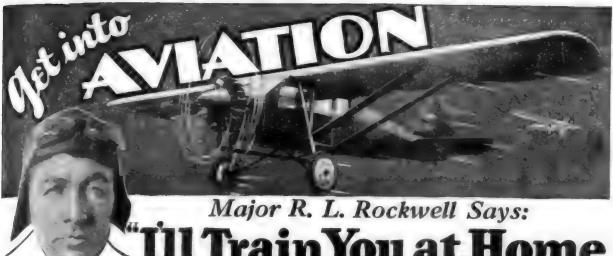

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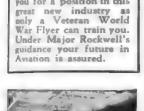

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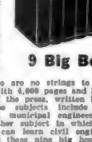

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"Shame on you!" Are you nervous, embarrassed or ill at ease? Stop being shy of strangers. Conquer the terrible fear of your superiors. Be cheerful and confident of your future! Your faults easily overcome so you can enjoy life to the fullest. Send 25c for this amazing book. Money back guaranteed.

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NOW! the SEAPLANE PARASOL

Build it Yourself for $228

Or $1175 Ready to Fly

"America's Most Popular Sportplane"

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This is the first time that a sea plane has been offered at even five times this price and it has a $10,000 performance besides.

Off the water in 8 seconds means that you can fly it from the smallest lake or river. Enjoy the beautiful timber land, yet with nature's perfect airdrome always below you. Fly at 10 ft. or 10,000 in safety with never a worry about forced landings as there are no fences or ditches on nature's perfect flying field.

With pontoons or wheels the HEATH PARASOL is the most economical transportation ever created, flying from 40 to 45 miles per gallon of gasoline.

Send 10c in stamps or coin for large illustrated booklet.

Elaborate detailed shop blue prints of the PARASOL SEA PLANE $7.00
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Heath Airplane Company

1721-29 SEDGWICK STREET
Dept. M-2 Chicago, Illinois

HEATH AIRPLANE CO.,
1727 Sedgwick St., Dept. M-2, Chicago, Ill.

Gentlemen: Enclosed find dime or stamps for which send me your large illustrated booklet on the Heath Super Parasol.

Name .....

Address .....

City ..... State .....

MOULDING A MIGHTY ARM

Get a 17 Inch Bicep

Complete Course on Arm Building

ONLY 25c

Get an arm of might with the power and grip to obey your physical desires. Within 30 days you can now build your arm from a scrawny piece of skin and bone to one of huge muscular size. I don't mean just a 17-inch bicep but a 15-inch forearm and an 8-inch wrist. This specially prepared course will build every muscle in the arm because it has been scientifically worked out for that purpose. You can develop a pair of triceps shaped like a horseshoe and just as strong, and a pair of biceps that will show their double head formation. The sinewy cables between the biceps and elbow will be deep and thick with wire cable ligaments. In that arm of yours, the forearm will belly with bulk, and the great supinator lifting muscle you can make into a column of power, while your wrist will grow alive and writhe with cordy sinew. All this you can get for 25 cents—send for this course today and within 30 days' time you can have a he-man's arm built to be as beautiful, brawny and magnificent as the village blacksmith's.

You can't make a mistake. The guarantee of the strongest armed man in the world stands behind this course. I give you all the secrets of strength illustrated and explained as you like it. 30 days will give you an unbreakable grip of steel and a Herculean arm. Mail your order now while you can still get this course at my introductory price of only 25c.

RUSH THE COUPON TODAY

To each purchaser will be given a FREE COPY of *THE THRILL OF BEING STRONG.* It is a priceless book to the strength fan and muscle builder. Full of pictures of marvelous bodied men who tell you decisively how you can build symmetry and strength the equal of theirs.

REACH OUT—GRASP THIS SPECIAL OFFER

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Astronomical and Terrestrial TELESCOPE Magnifies 30 Times

Own a genuine Astronomer's Telescope. See thousands of miles away. Make sun, moon, planets, stars your next door neighbors. Moon Craters, Sun Spots, Eclipses, Comets enlarged 30 times. Strange thrills!

Price Only $2.95

Hours of fun looking at scenery, games, bathing beauties. Great for trips and voyages. Made like telescopes used in observatories. Gerding wrote, "Moon seemed 10 yards away."

See Landscapes, Games, Ocean Scenes Enlarged 30 Times!

Diameter 2 inches. Special friction adjustment for focusing. Adjustable bracket and clamp can be fastened to chair, fence, branch, etc. Finest materials. Will last lifetime.

Five Days Free Trial

Rush only $1.00 now. Pay balance ($1.95 plus postage) when postman delivers. Keep 5 days. If not delighted, return telescope and money will be refunded.

EARN $10 A DAY
Charge 25c to look at the moon

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Dept. B-316
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$35 TO $75 WEEKLY

MEN-WOMEN — AGE 18 TO 55

( ) Railway Mail Clerk
( ) P. O. Clerk
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( ) Matron
( ) General Clerk
( ) Chauffeur-Carrier
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( ) Watchman
( ) Postmaster
( ) RFD Carrier
( ) Meat Inspector
( ) Special Agent (investigator)
( ) Steno-Typist
( ) Immigrant Insp.
( ) City Mail Carrier
( ) Border Patrol
( ) Typist
( ) Seamstress
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Instruction Bureau Dept. 233 St. Louis Mo.

Send me particulars about positions marked "X"—salaries, locations, opportunities, "How to Qualify", etc.

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I Train You In Your Own HOME

Learn to be an aeroplane designer. I will train you RIGHT IN YOUR OWN HOME. Here's your opportunity to get into the big money earning branch of Aviation—Designing aeroplanes. Copy the aeroplane picture shown here and mail to me with coupon below. If I think you show talent for this work and really want to train for a big pay position in aviation, I will mail you direct from my drafting room an aeroplane blueprint in three views with all main parts named and explained.

GET INTO AVIATION
through the Front Door~the Drafting Room

LEARN AERO~DRAFTING

If you want to fit yourself for a start toward making big money in AVIATION—get into the creative end of this rapidly growing industry. There are good aeroplane designers today who get $12,000 a year—*think of it*—$1,000 a month. Let me train you in Aero-Drafting—and put you in line for a position like this—Remember, *you don't need flying or mechanical experience* to become an Aero-Draftsman.

Former Factory Helper Raises Income to $7,000 a Year

A. H. Bernier of Detroit, Michigan—one of my students had a factory job at $12.00 a week when he enrolled with me. After taking my course he was picked from 65 men and made assistant Chief Draftsman.

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No matter what you are doing now—if you can read, write and understand plain simple English and want to get into Aero-Drafting, mail coupon today. Let me show you what I can do for you. See how I train you—at home—by my easy practical method—Learn about my employment service that is free to my students. Copy sketch and mail today!

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Pay-Raising Plan

Write today for this book which has started hundreds of men—many with but little education and no experience on the road to success. Learn about the drafting instruments I furnish my students without extra charge. And all the other features of my training. Write today.

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Town ..... State .....

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Complete $30 Outfit
Now Only
$5.00

TRY IT 10 DAYS

Builds Muscles Like Magic

GET strong—QUICKLY! Build yourself a powerful body. Take advantage of this smashing bargain! First time ever offered at this price. Now only $5 for this famous $30 value Complete Home Gymnasium. Try it 10 days at our risk. Convince yourself. See your muscles GROW. Mail below what you get. Everything included in this amazing SALE. Everything GUARANTEED. Also, the big 16-cable Chest Expander alone is worth more than you pay for entire outfit. Don't confuse with cheap imitations. This is the real McFADDEN Outfit.

SAVE $25 ON THIS FAMOUS OUTFIT

Look What You Get

1. 16-Cable Progressive Chest Expander, worth $6.00
2. Wall Apparatus Attachment, worth ..... .50
3. Patented Progressive Stirrup for Leg Muscles, worth 2.50
4. Scissor Grips, Iron, for developing wrist, hands, arms, worth 2.00
5. Patented Progressive Head Gear, absolutely adjustable, no chafing, no slipping, worth 3.00
6. Encyclopedia of Health and Strength, worth 2.00
7. 12 Weeks' Home Instruction Course in Scientific Muscle-Building, worth $5.00

TOTAL WORTH.... $30.00

YOURS FOR ONLY $5.00

Any of above may be purchased separately at prices shown.

RUSH COUPON

Let me send you this whole wonderful Muscle-Building Outfit to try at my risk. Never before a bargain like this. A complete Home Gymnasium that will pep you up and build you up—all for $5—and your Money Back if you don't agree it's the finest quality and biggest value ever offered at this price. Mail Coupon NOW.

Richard McFadden, Dept. W-147,
55 East 11th St., New York City

Richard McFadden, Dept. W-147,
55 East 11th St., New York City

Dear Mr. McFadden: I enclose $5 (1/6 regular value) for which please send me complete Muscle-Building Outfit to try—Chest Expander, Wall Apparatus Attachment, Stirrup, Scissor Grips, Head Gear, Encyclopedia, 12 Weeks' Instruction Course. My MONEY BACK if I return outfit in 10 days.

Name .....

Address .....

Town ..... State .....

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IN ELECTRIC REFRIGERATION

Here's your chance to escape forever from crowded fields, poor pay and limited future! America's newest and fastest-growing industry — Electric Refrigeration — needs trained men to fill sales, service, factory and executive positions at salaries up to $200 a week! Backed by General Motors, General Electric, etc. Get in on the ground floor NOW!

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UTILITIES ENGINEERING INSTITUTE
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UNTIL you learn to play, you have no idea of the rich joy, the vibrant fun, the big money that lie in the creation of music. And until you actually try out the Deagan Xylorimba in your own home, you have no idea how easy this fascinating instrument is to play!

Just think! No tiresome practice. No finger or lip exercises. No teacher. On the first day you play simple melodies. Soon you thrill friends and family with snappy fox trots, dreamy waltzes. Before you realize it, you are ready to appear in public. Xylorimbists are driven in demand. The pep of any party, the spice of any band or orchestra. $5 to $35 for a night of "play!"

BIG BOOK FREE—Deagan Xylorimbas are sold on a 5-day FREE TRIAL basis. Models to suit every pocketbook. Surprisingly easy terms. You owe it to yourself to write today for the BIG FREE BOOK. No cost or obligation. Simply fill in and mail the coupon.

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Please send me full details of the Five-Day Trial offer and easy payment plan of the Deagan Xylorimba.

Name .....

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Simplified Key Arrangement

Fingers fall naturally into playing position. Makes it extremely easy to play rapidly on the Buescher

SAXOPHONE

Easy to Play
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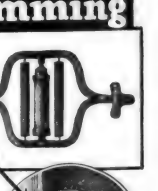
The Buescher True-Tone Saxophone is the easiest of all wind instruments to play and one of the most beautiful. You can learn the scale in an hour, and in a few weeks be playing popular music. First 3 lessons free, with each new Saxophone. For home entertainment —church—lodge—school or for Orchestra Dance Music, the Saxophone is the ideal Instrument.

FREE TRIAL—We allow 6 days' free trial on any Buescher Saxophone in your own home and arrange easy payments so you can pay while you play. Write for Saxophone Catalog.

BUESCHER BAND INSTRUMENT CO.
2949 Buescher Block (53) ELKHART, INDIANA

Let Slamming Doors Pay You a $15 Day



Amazing invention that ends all trouble, annoyance and expense of slamming doors, and brings fortunes to agents. Just one look at this clever device and the sale is made. Can be installed in a few minutes with just a screw driver. Saves nerves, besides enormous loss through broken glass and wasted fuel. Every office, factory, store, institution, or public building needs one for every noisy door.

Entirely New Principle---Works In Oil

Kant-Slam is different from any other door control. It's not pneumatic, but is built on new oil principle, that controls door like human hand. Gives lifetime service without adjustments. Always efficient in any weather.

Amazingly Low in Price!

Kant-Slam is neat, compact, light in weight and is lowest priced control ever offered with a factory guarantee. Pays big commission that makes agents $15 a day and more, easily, just showing it. Simple demonstrator does all the work. Just take orders and collect the big commissions in ADVANCE!

Clever Demonstrator Offered FREE!

Look! A full sized sample on miniature door furnished every active agent! Can I offer you more than this? An actual working sample mounted on an easy-to-carry, light weight miniature door. With this clever demonstrator you can't fail. Sales pour in, and in just a few minutes' time. Demonstrate this clever device—tell how it saves thousands of dollars each year in fuel and broken glass and you're bound to make good. Mail the coupon for **Amazing Free Offer.**

Mail Coupon for FREE OFFER

NOW—TODAY is the time to mail the coupon for TREMENDOUS FREE OFFER. Get in on the ground floor and clean up the profits being distributed among my representatives. Just open and shut your demonstrator 5 or 6 times a day and you'll be making $30, $40, and $50 a week just as easy as singing a song. You can't afford to wait, because territories are being taken as fast as we can hand them out—mail your name and address on coupon below, and I'll reserve your territory for you.

Kant-Slam Door Check Co
Dept. X-11 BLOOMFIELD, IND

KANT-SLAM DOOR CHECK CO.,
DEPT. X-11, BLOOMFIELD, IND.

GENTLEMEN: Please reserve my territory, and send me full details of your AMAZING FREE OFFER. I am not obligated.

Name .....

Address .....

Town ..... State .....

STRAIGHT-LINE

OLD MONEY and stamps WANTED

POST YOURSELF! It pays! I paid J. D. Martin, Virginia, $200 for a single copper cent. Mr. Manning, New York, $2,500 for one silver dollar, Mrs. G. F. Adams $740 for a few old coins. I want all kinds of old coins, medals, bills and stamps. I pay big cash premiums.

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Dept. 90 FORT WORTH, TEXAS
(Largest Rare Coin Establishment in U. S.)

Don't Let $10 Stand Between You And A Good Head Of Hair

For years I suffered from dandruff and falling hair, until a friend told me an old Canadian method. This treatment will stop falling hair, eradicate dandruff and grow new hair. My baldness has been replaced with luxuriant new hair. Dozens of my friends have had equal results. The method is simple, easy and positive. Send me $1.00 to cover costs and I will mail you this prescription and method of treatment with my positive guarantee that you will be satisfied or I will return your money. A few cents at any druggists buys the necessary ingredients. You will thank me many times, as my friends have, for telling this method which has succeeded where everything else has failed. $1.00 only, and your hair trouble is solved for the rest of your life.

STED PITT, Dept. I-O, 153 Court Street, New Haven, Conn.

RUPTURED

people praise this improved appliance

Forget about rupture pains and the need for constant care and watchfulness. Hold your rupture this secure, sanitary way. This perfected appliance retains rupture safely and with great comfort, and at the same time promotes healing. Out-of-door men praise this better way to hold their ruptures. It binds the separated muscle fibres together. It gives absolute freedom in body movements. Over 3,000,000 Brooks Appliances sold.

Write for our 10-day trial offer, and 28-page Rupture booklet. Sent in plain sealed envelope.

Brooks Appliance Co., 146A State Street, Marshall, Mich.

TRAVEL - for 'UNCLE SAM'

RAILWAY POSTAL CLERKS
MAIL CARRIERS—POSTOFFICE CLERKS
PROHIBITION AGENTS—FILE CLERKS

$1700 to $3400 a Year for Life

No "lay-offs" because of strikes, poor business, etc. — sure pay — rapid advancement. Many other U. S. Government jobs. City and country residents stand same chance. Common sense education usually sufficient.

STEADY WORK

Cut coupon and mail it before turning the page.

MEN—BOYS 18 to 45

Use Coupon Before You Lose It

COUPON

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Rush to me, free of charge, (1) A full description of the position checked below; (2) 32-page book, with list of openings obtainable; (3) Tell me how to get the position checked.

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Here in 15 wonderful texts is *your* complete High School Education. Every subject taught by fascinating "Question and Answer" method. Now used in 12,000 high schools. Certificate awarded. It's *fun* to learn this easy inexpensive spare-time way. Greatest bargain in brain power.

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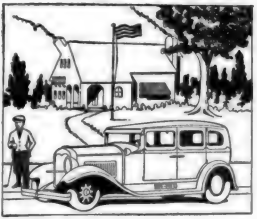
Send for Free Book Find out how YOU can quickly prepare for bigger pay and social culture. Send this ad with name and address for FREE booklet, "What a High School Education Can Do for Me."

High School Home Study Bureau, 31 Union Square, Dept. 4732, New York, N.Y.

WHAT'S WRONG WITH THIS PICTURE?

See If You Can Find the Mistakes in This Picture



We will spend over $147,000.00 this year for the purpose of conducting free prize offers to advertise and expand our business. Thousands of persons are going to receive valuable prizes or cash awards and compensations this year through our offers. The sky is the limit! Anyone living in the United States outside of Chicago, except employees of this company, members of their families, or our previous auto or first prize winners, or members of their families, may enter an answer to this puzzle.

$7,346 In Prizes Given in This One Offer

Seven Big New 6-Cylinder Sedans and Other Valuable Prizes

Try your skill—it costs you nothing. Study the picture shown above, but look carefully. The artist has purposely made many mistakes. Can you find four or more of them? These mistakes can be found in various objects in the picture—that's all the hint we can give you. If you think you can find four or more mistakes, answer at once. Just mark the mistakes in pencil on the picture, or tell me what they are in a letter or on a post card. Only four mistakes are required for a perfect answer.

Anyone Who Answers This Puzzle Correctly May Receive Prizes or Cash!

Man, woman, boy, or girl—it doesn't matter who or what you are. Seven of the people who take up this offer are going to win wonderful automobiles. You can be among them. Answer today! Duplicate prizes awarded in case of ties.

Additional $500.00 for Promptness

$500.00 extra will be awarded in addition to first prize if you are prompt. If your answer is judged to be perfect, I will tell you without delay about winning the prize. Hurry now! Address your answer to G. W. ALDERTON, Advertising Manager, Dept. 99 810 North Dearborn St., Chicago, Ill.

Watch!

It "Taxies" "Takes off" Flies

Boys! Picture a great airplane roaring down the runway – faster—faster—faster! Then, Z-O-O-M and she's up in the air. What a thrill! Well—now you can have a toy plane that has precisely the same flight action. Not a construction toy, but a fully built plane. A few moments to assemble and she's ready for flight. Wings and body of light Balsa wood, reinforced with aluminum; aluminum propeller; powerful elastic motor, Model 21, Cabin Type, 22 in. wing spread, $2.98; Racing Model No. 7, 18 in. wing spread, $1; No. 2, 28 in. wing spread, $2.00. (West of Miss. $2.75-$1.10-$2.20). Look for them at your dealers. If not in stock we will ship direct. KINGSBURY MFG. CO. 186 B Myrtle St., Keene, N. H.

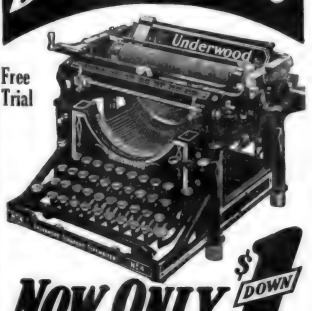
Send 10c for a Kingsbury Disc Wheel, Balloon Tire Eraser

KINGSBURY Motor Driven TOYS

Genuine

UNDERWOOD

Below ½ Price



Free Trial

NOW ONLY $1 DOWN

STANDARD 4-ROW KEYBOARD

Think of it! Only $1.00 brings the World's most famous Underwood Typewriter for 10 days' free trial. Lowest price and easiest terms ever offered. Pay only 10c a day on easy monthly payment plan. This is the full size standard Underwood 4-row keyboard typewriter, manufactured to sell for $100.00.

Do not confuse this 4-row standard office model Underwood with other frail machines originally costing only one-half as much.

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FREE

We teach you free. Complete Home Study Course of the famous Van Sant Speed Typewriting System, fully illustrated, easily learned, used in schools, business offices, everywhere.

Easy Terms
10 Day FREE Trial

This late model Underwood, specially priced at $39.90 (cash) is the lowest price ever quoted; has modern improvements, including 4-row keyboard, two-color ribbon, back spacer, ribbon reverse, tabulator, release, shift lock and many other improvements. Beautifully refinished and renewed. Looks and operates like brand new.

Send at Once!

This exceptional bargain offer is for a very limited time only. Remember—every one of these famous Underwoods is fully guaranteed and shipped on 10 days' Free Trial. Send at once.

INTERNATIONAL TYPEWRITER EXCHANGE
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I enclose $1 deposit. Send No. 4 at once for 10 day Free Trial. If I am not perfectly satisfied I can return it Express Collect and get my deposit back. If I keep it I will pay $3 a month until I have paid $41.90 in full.

Name ..... Age .....

Address .....

Town ..... State .....

Play the Hawaiian Guitar like the Hawaiians!

Only 4 Motions used in playing this fascinating instrument. Our native Hawaiian instructors teach you to master them quickly. Pictures show how. Everything explained clearly.

Play in Half Hour
After you get the four easy motions you play harmonious chords with very little practice. No previous musical knowledge needed.

Easy Lessons
Even if you don't know one note from another, the 52 printed lessons and clear pictures make it easy to learn quickly. Pay as you play.

GIVEN when you enroll
—a sweet toned HAWAIIAN GUITAR, Carrying Case and Playing Outfit—
Value $25.00 Extra
No extra—everything included

WRITE AT ONCE for attractive offer and easy terms. You have everything to gain. A postcard will do. ACT!

OTHER COURSES Banjo, Ukulele, Tenor Guitar, Violin, Banjo Ukulele Under well known instructors.

FIRST HAWAIIAN CONSERVATORY of MUSIC, Inc.
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A GENUINE 240 POWER MICROSCOPE!

Sent for Only $1.00 DOWN

An educational and entertaining instrument that enables all to see and know life invisible to the naked eye. Thrills and fun galore! See tiny bugs grow to proportions of great elephants. See plant and mineral life reveal amazing wonders in form and color. Made just like microscopes used by physicians, scientists, etc. Now only $3.98. Could easily sell for $10 and $20 more. Adjustable lens of 240 power! Send only $1.00. Pay balance ($2.98 plus postage) when postman delivers.

IDEAL FOR STUDENTS!
Here is an ideal microscope for college and high school students. A wonderful help in studying science, botany, etc. Never before has such a wonderful instrument been offered at such an amazingly low price of $3.98.

Dealers and Teachers Write for Our Proposition!

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Dept. B-338

TOBACCO
Habit Overcome Or No Pay

Over 500,000 men and women used Superba Remedy to help stop Cigarettes, Cigars, Pipe, Chewing or Snuff. Write for full treatment on trial. Contains no dope or habit forming drugs. Costs $2.00 if successful, nothing if not. SUPERBA CO. A-16, Baltimore, Md.

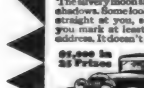
Win $3,500

or Buick Sedan and $1,500 Cash

Great advertising campaign now on! We are giving thousands of dollars in special rewards in addition to $5,000 in 25 Grand Prizes, including 3 autos, to advertise our business. F. Sieglinger won $3,000, Helen Zike won $1,075, Tillie Bohle won $1,500 and scores of others. *Now bigger than ever.* SOMEONE WINS $3,500—WHY NOT YOU? Enter now and

FIND 7 FACES

The silvery moon shining thru trees and bushes makes some funny shadows. Some look like faces. Can you find 7 or more? Some look straight at you, some are upside down. Look sharp and if you mark at least 7 clip picture and send to me with name and address. It doesn't cost a cent to win. Nothing to buy now or later.



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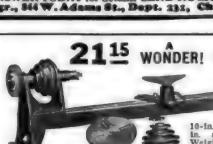

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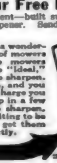

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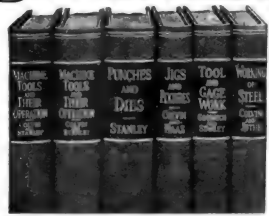

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Rebuilding the Lawrence Engine

(Continued from page 166)

When this procedure is finished take the rods and line them up by placing them in a large vise and using a large monkey wrench. After you have them absolutely in line in all directions dress the welded parts up.

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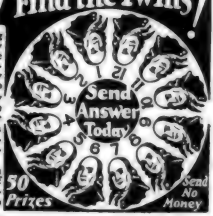

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Dear Sir:—Please send me without any obligation on my part whatever, a copy of your latest book, "Muscular Development." (Please write or print plainly.)

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Street .....

City..... State.....

It contains forty-eight, full page photographs of myself and some of the many prize-winning pupils I have trained. Some of these came to me as pitiful weaklings, imploring me to help them. Look them over now, and you will marvel at their present physiques. This book will prove an impetus and a real inspiration to you. It will thrill you through and through. This will not obligate you at all, but for the sake of your future health and happiness, do not put it off. Send today—right now, before you turn this page.

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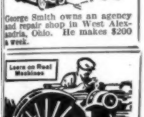
—takes *only* 8 weeks to get a big job

and Earn $50 to $125 Weekly as Auto or Aviation Expert

George Smith owns an agency and repair shop in West Alexandria, Ohio. He makes $200 a week.



C. E. Gillespie has charge of a fleet of trucks and tractors for the State Highway Commission, due to McSweeny training.

D. M. Collins, Williamsville, West Virginia, writes: "After finishing McSweeny training, I started as manager of a garage at $300 a month."

Learn the Automotive or Aviation business by the McSweeny system. Get ready to step out and hold a real job. Earn $50 to $125 a week. Or, you can open a garage and repair shop and clean up as high as $10,000 a year. It's no idle dream—no fanciful goal—but actual accomplishments of many McSweeny graduates. The Automobile, Tractor, and Aviation Business needs Trained men. Opportunities are everywhere. Good openings galore. Eight weeks training with McSweeny fits you to open your own place or go with one of the many firms seeking trained men. Read what George Smith, C. E. Gillespie and D. M. Collins have done. And there are hundreds of other McSweeny trained men who can tell you just as interesting facts. Every month McSweeny graduates are supplanting the inexperienced, untrained men.

You Do Actual Work on Real Equipment

First we tell you, then show you, then you actually do the work yourself—you learn Mac's practical way—we use no books—no lessons—an education is not necessary. A green man works shoulder to shoulder with the man who has had years of experience. The McSweeny way is the real way to big pay. Learn a trade that can never be replaced by machinery. Automobile, Tractor and Aviation repair and maintenance can never be put on a production basis.

You Can Learn in Only 8 Weeks!

Yes sir—in only eight short weeks McSweeny will train you so you can qualify for a big pay job in the Auto, Tractor or Aviation fields. You don't need any advance education. In fact, very little schooling is necessary. Any man from 16 to 60 can easily learn and master the clear, concise, simple McSweeny Course. And think of it, in just 8 weeks you can do it. In only 8 weeks you will be ready to step into a big job paying $50 to $125 weekly. Why fool away your time with small pay jobs when it's so easy to make real money through McSweeny training? And you can do it in such a short time. You are protected in every way. Read the money-back guarantee below. You have every chance to win out in the biggest sort of way without risk. Take advantage of my Remarkable Limited Tuition Offer by mailing the coupon to me at once. No facilities for colored students.

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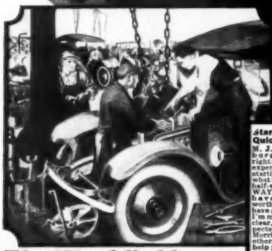

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M. J. Morriston, Parkersburg, W. Va. (photo at right), never had a day's experience on cars before starting my training. Read what he says when less than half-way through his "JOB-WAY" course. "What I have already learned is worth over $500 to me. I have gone into business and I'm making over $50 a week clear, with wonderful prospects." And what Mr. Morriston and hundreds of others have done I will help you to do!

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Don't sell your time for low pay! You don't need to when you have my "JOB-WAY" training. As Directing Engineer of this Institution I know what training you need to succeed, AND I GIVE YOU THAT TRAINING right in your own home. MASTER every branch of Auto, Truck and Tractor work. I train you with JOBS—not books. I bring the original "JOB-WAY" training TO YOUR HOME!

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Ten agreements in my big free Auto book. No. 1 is "I will refund every cent of your money if after receiving my training you are not absolutely satisfied." This and nine other wonderful agreements make my "JOB-WAY" course the training for you! Be sure to get my book and read all ten agreements.

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